



United States Department of the Interior
Fish and Wildlife Service

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In Reply Refer To:

AESO/SE
2-21-92-F-550
2-21-96-F-187

December 11, 1998

Alexis Strauss
Director, Water Management Division
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105-3901

Dear Ms. Strauss:

This responds to the U.S. Fish and Wildlife Service receipt of the Environmental Protection Agency's request for formal section 7 consultation as provided by the Endangered Species Act, as amended, on the approval of the 1996 modifications to the Arizona Water Quality standards. Your October 21, 1997, request for formal consultation was received on October 27, 1997. This document represents the Service's biological opinion on the effects of that action on the aquatic and aquatic dependent species listed below, in accordance with section 7 of the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 et seq.).

This biological opinion is based on information provided in the June 27, 1996, biological evaluation, and the October 21, 1997, supplemental biological evaluation, telephone conversations, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file in this office.

We appreciate the details provided in your October 14, 1998, letter noting EPA's plans for implementation of the reasonable and prudent measure and associated terms and conditions. We also appreciate your leadership in supporting the discretionary conservation measures.

SUMMARY

The purpose of the water quality standards, under both federal and state law, are to achieve, wherever attainable, a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and which provides for recreation in and on the water. The Service recognizes that there are occasions when the standards as written are not met. Further, monitoring reports and enforcement issues also vary the degree of protection. Facilities which do not meet water quality standards as defined in the 1996 standards, are not protected under the analysis of this consultation and should be evaluated for potential impacts to listed species. Assuming the Arizona water quality standards are met as written, it is the finding of the Service that the

proposed action is not likely to jeopardize the continued existence of the threatened Apache trout (Oncorhynchus apache), threatened beautiful shiner (Cyprinella formosa) with critical habitat, endangered bonytail chub (Gila elegans) with critical habitat, endangered Colorado squawfish (Ptychocheilus lucius), endangered desert pupfish (Cyprinodon macularius) with critical habitat, Gila topminnow (Poeciliopsis occidentalis occidentalis), endangered Gila trout (Oncorhynchus gilae), endangered humpback chub (Gila cypha) with critical habitat, threatened Little Colorado spinedace (Lepidomeda vittata) with critical habitat, threatened loach minnow (Tiaroga cobitis), endangered razorback sucker (Xyrauchen texanus) with critical habitat, threatened Sonora chub (Gila ditaenia) with critical habitat, threatened spikedace (Meda fulgida), endangered Virgin River chub (Gila robusta seminuda), endangered woundfin (Plagopterus argentissimus), threatened Yaqui catfish (Ictalurus pricei) with critical habitat, endangered Yaqui chub (Gila purpurea) with critical habitat, endangered Yaqui topminnow (Poeciliopsis occidentalis sonoriensis), threatened bald eagle (Haliaeetus leucocephalus), endangered Whooping crane (Grus americana), endangered Yuma clapper rail (Rallus longirostris yumanensis), endangered Brown pelican (Pelecanus occidentalis), endangered Canelo Hills ladies'-tresses (Spiranthes delitescens), endangered Huachuca water umbel (Lilaeopsis schaffneriana ssp. recurva), endangered Sonora tiger salamander (Ambystoma tigrinum stebbinsi), or the endangered southwestern willow flycatcher (Empidonax traillii extimus) with critical habitat.

Two reasonable and prudent measures and seven terms and conditions are described to reduce the amount of take of listed species.

The Service has reviewed your biological evaluation and concurs with your findings that the EPA approval of the 1996 Arizona water quality standards is not likely to adversely affect the endangered cactus ferruginous pygmy-owl (Glaucidium brasilianum cactorum). Therefore, unless new information reveals effects of the proposed action that may affect listed species in a manner or to an extent not considered in this proposed action, no further action pursuant to the Endangered Species Act of 1973, as amended, is necessary for this species.

It is the finding of the Service that this action will have no effect to the whooping crane (Grus americana), Kanab ambersnail (Oxyloma haydeni kanabensis), jaguar (Panthera onca). In the 1994 biological opinion, the Service concluded no effect to the beautiful shiner, Yaqui chub, Yaqui topminnow or Gila topminnow in those areas where they occur in artesian well-fed troughs or other created habitats that are not subject to point or non-point sources of discharge (Refer to February 1994 biological opinion for a complete list). Since only one determination can be made for a species or a given project, effects to the beautiful shiner, Yaqui chub, Yaqui topminnow and Gila topminnow were analyzed throughout the project area under this consultation.

The proposed action would have no effect to the proposed endangered Parish alkali grass (Puccinellia parishii) or the San Xavier talussnail (Sonorella eremita) addressed in your October 21, 1997 letter. The flat tailed horned lizard (Phrynosoma mcallii), also addressed in your October 1997 letter has been removed from listing consideration and does not need to be addressed further in this document.

CONSULTATION HISTORY

This is a reinitiation of the consultation between EPA and the Service on the 1992 Arizona water quality standards. The first consultation addressed the Arizona water quality standards which were adopted by ADEQ on January 10, 1992, and subsequently adopted by the Arizona Attorney General on February 18, 1992. EPA approved of all but six of the state standards. The first consultation of the Arizona water quality standards concluded with the issuance of the February 16, 1994 biological opinion of the approved standards. The Service concluded the following rules were likely to jeopardize the continued existence of listed species in Arizona: proposed numeric water quality standards rule for toxic pollutants - bioaccumulation, adequacy of aquatic and wildlife warm (A&Ww) criteria for cyanide and phenol, adequacy of A&Ww criteria for cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and toxaphene in aquatic and wildlife effluent dominated waters, and criteria development. A full explanation of the 1992 Triennial Review process can be found in the February 1994 biological opinion.

On April 9, 1996, the Service received a biological evaluation and a request for a separate consultation on the court-ordered proposal and promulgation of the six outstanding disapproved rules on the 1992 water quality standards. A full description of that process can be found in the April 9, 1996, letter from ADEQ (ADEQ 1996a) to the Service, and an April 23, 1996, letter from this office to EPA and ADEQ (USFWS 1996).

Informal consultation on the 1996 Arizona water quality standards began with a telephone call from Gary Wolinsky of EPA to Debra Bills of the Arizona Ecological Services Field Office. A follow-up letter included a transmittal of a statewide species list was sent from this office to EPA on February 29, 1996. The revised water quality standards were adopted by the State of Arizona on April 24, 1996. On May 23, a conference call between Tom Gatz and Ted Cordery of this office with Catherine Kuhlman and Gary Wolinsky of EPA concluded that this consultation would reopen the first consultation which ended with the issuance of the February 16, 1994, biological opinion.

An updated species list was sent from this office on April 22, 1997, in response to a April 14, 1997, telephone call from Gary Wolinsky to Debra Bills. The Service received a biological evaluation from EPA on June 27, 1996. In accordance with the regulations governing interagency consultations (50 CFR 402.14), the Service returned the biological evaluation to EPA on September 9, 1996, requesting additional information and points of clarification. EPA responded with a revised biological evaluation dated October 21, 1997. The Service responded with a December 3, 1997, letter stating that we had sufficient information to initiate consultation, and acknowledged receipt of EPA's October 21, 1997, letter the day the formal consultation began. On July 15, 1998, the Service sent a draft biological opinion to EPA. On October 19, 1998, the Service received the October 15 EPA response clarifying your agencies procedures for implementation and requested a final biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The action for this formal consultation is the proposed EPA approval of the Arizona water quality standards for surface waters or water of the U.S. (previously referred to as navigable waters). Pursuant to section 303(c)(1) of the Clean Water Act, requires that states review their water quality standards at least once every three years and revise them where it is appropriate to do so. Under A.R.S. §49-202(A), the ADEQ is responsible for conducting the review of the state's water quality standards, holding public hearings, and, as appropriate, revise and adopt standards every three years as part of a continuing triennial review process. Results of such reviews are submitted to EPA, pursuant to CWA section 303(c)(2)(A). The revised or new water quality standards consist of the designated uses of surface waters and the water quality criteria for such waters. Such standards should provide protection for both human health and aquatic life. Section 303(c)(2)(B) of the CWA requires the State to adopt numeric criteria for all toxic pollutants listed pursuant to the CWA section 307(a)(1) for which criteria have been published under section 304(a). Under section 304(a), EPA has produced a series of scientific water quality criteria guidance documents, which States consider when adopting regulatory criteria. Pursuant to section 303(c)(3) of the CWA, the EPA approves and/or disapproves all or portions of the State's revised or new water quality standards. If EPA determines that any such revised or new standard is not consistent with the applicable requirements of the CWA, then EPA will notify the State of the disapproved portions and specify the changes needed to meet the requirements. EPA will promulgate standards for the disapproved portions, pursuant to section 303(c)(4), if the State has not rectified the problem.

The principal application of the EPA approved and/or promulgated water quality criteria is the National Pollutant Discharge Elimination System (NPDES) permit program. The Arizona water quality standards will provide generic guidelines for the NPDES permit writers to develop conditions and limits for inclusion in such permits. The action area consists of all surface waters are their tributaries in Arizona that have an identified designated use.

A full description of the 1996 Arizona Water Quality Standards may be found in the Arizona Administrative Code, Title 18, Chapter 11 (ADEQ 1996b). The following descriptions of Article 1 - Water Quality Standards for Navigable Waters includes the final versions of the state adopted standards. Items modified between the 1992 and 1996 standards are discussed in the Effects of the Action section. Additions and modifications are written as underlined, deletions are written as ~~strikeout~~.

Article 1. Water Quality Standards for Surface Waters

R18-11-102. Applicability - modified rule

A. The water quality standards prescribed in this Article apply to all ~~navigable~~ surface waters.

B. The water quality standards prescribed in this Article do not apply to the following:

1. Waste treatment systems, including impoundments, ponds, lagoons, and constructed wetlands that are a part of such waste treatment systems.

2. Mining Impoundment Exemption. Man-made surface impoundments and associated ditches and conveyances, tailing impoundments, ponds, or other catchments used for on-site remediation that are not a surface water or are located in an area that once was a surface water but no longer remains a surface water because it has been and remains legally converted.

R18-11-103. Rule has been repealed. Effective April 24, 1996.

R18-11-104. Designated Uses. Modified rule

A. The Director shall adopt or remove designated uses and subcategories of designated uses by rule.

B. Designated uses of a surface water may include full body contact, partial body contact, domestic water source, fish consumption, aquatic and wildlife (cold water fishery), aquatic and wildlife (warm water fishery), aquatic and wildlife (ephemeral), aquatic and wildlife (effluent dependent water), agricultural irrigation, and agricultural livestock watering. Designated The designated uses for specific surface waters are listed in Appendix B (enclosed) of this Article.

C. Numeric water quality criteria to protect the designated uses are prescribed in Appendix A (enclosed), R18-11-109, R18-11-110, and R18-11-112. Narrative standards to protect all surface waters are prescribed in R18-11-108.

~~D. A navigable water that is not listed in Appendix B but that is tributary to a listed navigable water shall be protected by the water quality standards that have been established for the nearest downstream navigable water listed in Appendix B that is not an effluent dominated water. Where the nearest downstream listed water is an ephemeral water, the A&We and PBC standards shall apply only to that portion of the tributary that is an ephemeral water. The A&Ww and FBC standards shall apply to that portion of the tributary that is not an ephemeral water.~~

~~D. If a surface water has more than 1 designated use listed in Appendix B, the applicable water quality criterion for a pollutant is the most stringent of those prescribed to protect the designated uses of the navigable water then the most stringent water quality criterion applies.~~

E. The Director shall revise the designated uses of a surface water if water quality improvements result in a level of water quality which permits a use that is not currently listed as a designated use in Appendix B.

F. In designating uses of a surface water and in establishing water quality criteria to protect those designated uses, the Director shall take into consideration the applicable water quality standards for downstream surface waters and shall ensure that the water quality standards that are established for an upstream surface water also provide for the attainment and maintenance of the water quality standards of downstream surface waters.

G. A use attainability analysis shall be conducted prior to removal of a designated use or adoption of a subcategory of a designated use that requires less stringent water quality criteria.

H. The Director may remove a designated use or adopt a subcategory of a designated use that requires less stringent water quality criteria provided the designated use is not an existing use and it is demonstrated through a use attainability analysis that attaining the designated use is not feasible for any of the following reasons:

1. Naturally occurring pollutant concentrations prevent the attainment of the use;
2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, ~~unless these conditions may be compensated for by the discharge of a sufficient volume of treated wastewater without violating water conservation or other applicable requirements; Nothing herein shall be construed to require releases of treated wastewater.~~
3. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;
4. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the surface water to its original condition or to operate such modification in a way that would result in attainment of the use; ~~Nothing herein shall be construed to require the release of water from dams;~~
5. Physical conditions related to the natural features of the surface water, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life designated uses; or
6. Controls more stringent than those required by §§ 301(b) and 306 of the Clean Water Act are necessary to attain the use and implementation of such controls would result in substantial and widespread economic and social impact.

R18-11-105. Tributary Rule - new rule

The following water quality standards apply to a surface water that is not listed in Appendix B but that is tributary to a listed surface water:

1. For an unlisted tributary that is an ephemeral water, the aquatic and wildlife [ephemeral] and partial-body contact standards shall apply.
2. For an unlisted tributary that is an effluent dependent water, the aquatic and wildlife [effluent dependent water] standards and partial-body contact standards shall apply.
3. For an unlisted tributary that is not an ephemeral water or an effluent dependent water and which has salmonids present, the aquatic and wildlife [cold water fishery] and fish consumption standards shall apply as well as the water quality standards that have been established for the nearest downstream surface water listed in Appendix B that is not an ephemeral water or an effluent dependent water.

4. For an unlisted tributary that is not an ephemeral water or an effluent dependent water and which does not have salmonids present, the aquatic and wildlife [warm water fishery] and fish consumption standards shall apply as well as the water quality standards which have been established for the nearest downstream surface water listed in Appendix B that is not an ephemeral water or effluent dependent water.

R18-11-106. Net Ecological Benefit - new rule

A. The Director, may by rule, modify a water quality standard on the ground that there is a net ecological benefit associated with the discharge of effluent to support or create a riparian and aquatic habitat in an area where such water resources are limited. The Director may modify a water quality standard for a pollutant if it is demonstrated that:

1. The discharge of effluent creates or supports an ecologically valuable aquatic, wetland, or riparian ecosystem in an area where such resources are limited.
2. The ecological benefits associated with the discharge of effluent under a modified water quality standard exceeds the environmental costs associated with the elimination of the discharge of effluent.
3. The cost of treatment to achieve compliance with a water quality standard is so high that it is more cost effective to eliminate the discharge of effluent of the surface water. The discharger shall demonstrate that it is feasible to eliminate the discharge of effluent which creates or supports the ecologically valuable aquatic, wetland, or riparian ecosystem and that a plan to eliminate the discharge is under active consideration.
4. The discharge of effluent to the surface water will not cause or contribute to a violation of a water quality standard that has been established for a downstream surface water.
5. All practicable point source discharge control programs, including local pretreatment, waste minimization, and source reduction programs, are implemented; and
6. The discharge of effluent does not produce or contribute to the concentration of a pollutant in the tissues of aquatic organisms or wildlife that is likely to be harmful to humans or wildlife through food chain concentration.

B. The Director shall not modify a water quality criterion for a pollutant to be less stringent than a technology-based effluent limitation which applies to the discharge of that effluent. The discharge of effluent which creates or supports an ecologically valuable aquatic, riparian, or wetland ecosystem shall, at a minimum, comply with applicable technology-based effluent limitations.

R18-11-107. Antidegradation - modified rule

- A. The determination of whether there is any degradation of water quality in a navigable water shall be on a pollutant by pollutant basis.
- B. Tier 1: The level of water quality necessary to protect existing uses shall be maintained and protected.
- C. Tier 2: Where existing water quality in a surface water is better than the applicable water quality standard, the existing water quality shall be maintained and protected.
- D. Tier 3: Existing water quality shall be maintained and protected in a surface water that is

classified as a unique water or that the Director has proposed for classification as a unique water pursuant to A.A.C. R18-11-112.

E. Nothing in this Section or in the implementation of this Section shall be inconsistent with §316 of the Clean Water Act where a potential water quality impairment associated with a thermal discharge is involved.

R18-11-108. Narrative water quality standards - modified rule

A. The surface water shall be free from pollutants in amounts or combinations that:

1. Settle to form bottom deposits ("bottom deposits rule") that inhibit or prohibit the habitation, growth, or
2. Cause objectionable odor in the area in which the surface water is located;
3. Cause off-taste or odor in drinking water;
4. Cause off-flavor in aquatic organisms or waterfowl;
5. Are toxic to humans, animals, plants, or other organisms ("toxics rule");
6. Cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth, or propagation of other aquatic life or that impair recreational uses ("nutrient rule");
7. Cause or contribute to a violation of an aquifer water quality standard; or
8. Change the color of the surface water from natural background levels of color.

B. A surface water shall be free from oil, grease, and other pollutants that float as debris, foam, or scum; or that cause a film or iridescent appearance on the surface of the water; or that cause a deposit on a shoreline bank, or aquatic vegetation. The discharge of lubricating oil or gasoline associated with the normal operation of a recreational watercraft shall not be considered a violation of this narrative standard.

R18-11-109. Numeric water quality standards - modified rule

A. The water quality standards prescribed in this Section apply to surface waters listed in Appendix B and their tributaries. Additional numeric water quality standards for unique waters are prescribed in R18-11-112.

B. The following water quality standards for fecal coliform, expressed in colony forming units per 100 milliliters of water shall not be exceeded:

1. <u>Fecal Coliform</u>	<u>DWS, PBC, A&W, AgI, AgL</u>
30-day geometric mean	1000
(5 sample minimum)	
10% of samples for	
a 30-day period	2000
Single sample maximum	4000
2. Fecal coliform in	
effluent dependent waters	<u>All designated uses</u>
30-day geometric mean	200
(5 sample minimum)	
10% of samples for a	
30-day period	400

Single sample maximum

800

C. The following water quality standards for Escherichia coli (E. coli), expressed in colony forming units per 100 milliliter of water shall not be exceeded:

E. coli

FBC

30-day geometric mean (5 sample minimum)

130

Single sample maximum

580

D. The following water quality standards for pH, expressed in standard units, shall not be violated:

pH	DWS	FBC, PBC, A&W	AgI	AgL
Maximum	9.0	9.0	9.0	9.0
Minimum	5.0	6.5	4.5	6.5
Maximum change due to discharge	NNS	0.5	NNS	NNS

E. The following maximum allowable increase in ambient water temperature, expressed in degrees Celsius, shall not be exceeded:

Temperature	A&Ww, A&Wedw	A&Wc
Maximum increase due to discharge	3.0	1.0

F. The following water quality standards for turbidity, expressed as a maximum concentration in nephelometric turbidity units (NTU), shall not be exceeded:

Turbidity	A&Ww, A&Wedw	A&Wc
Rivers, streams and other flowing waters	50	10
Lakes, reservoirs, tanks and ponds	25	10

G. The following are the water quality standards for dissolved oxygen, expressed in milligrams per liter (mg/L). The dissolved oxygen concentration in a surface water shall not fall below the following minimum concentrations:

	A&Ww	A&Wc
1. Dissolved oxygen		
Single sample minimum	6.0	7.0

2. Dissolved oxygen in

effluent dependent waters

(single sample minimum)

A&Wedw

3 hours after sunrise to sunset

3.0

Sunset to 3 hours after sunrise

1.0

3. If the dissolved oxygen (mg/L) of a surface water is less than the water quality standard for dissolved oxygen, but the percent saturation of oxygen is equal to or greater than 90% then the surface water shall be deemed to be in compliance with the water quality standard for dissolved oxygen.

H. The following water quality standards for total phosphorus and total nitrogen, expressed in milligrams per liter, shall not be exceeded:

Annual	90th	Single Sample
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- | | <u>mean</u> | <u>percentile</u> | <u>Maximum</u> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------|----------------|
| 1. Verde River and its tributaries from headwaters to Bartlett Lake | | | |
| Total phosphorus | 0.10 | 0.30 | 1.00 |
| Total nitrogen | 1.00 | 1.5 | 3.00 |
| 2. Black River, Tonto Creek and their tributaries that are not on tribal lands: | | | |
| Total phosphorus | 0.10 | 0.30 | 1.00 |
| Total nitrogen | 0.50 | 1.00 | 2.00 |
| 3. Salt River and its tributaries, except Pinal Creek, above Roosevelt Lake that are not located on tribal lands: | | | |
| Total phosphorus | 0.12 | 0.30 | 1.00 |
| Total nitrogen | 0.60 | 1.20 | 2.00 |
| 4. Roosevelt, Apache, Canyon and Saguaro Lakes | | | |
| Total phosphorus | 0.03 | NNS | 0.60 |
| Total nitrogen | 0.30 | NNS | 1.00 |
| 5. Salt River below Stewart Mountain Dam to confluence with the Verde River | | | |
| Total phosphorus | 0.05 | NNS | 0.20 |
| Total nitrogen | 0.60 | NNS | 3.00 |
| 6. Little Colorado River and its tributaries above River Reservoir in Greer; South Fork of Little Colorado River above South Fork Campground; Water Canyon Creek above Apache-Sitgreaves National Forest boundary | | | |
| Total phosphorus | 0.08 | 0.10 | 0.75 |
| Total nitrogen | 0.60 | 0.75 | 1.10 |
| 7. Little Colorado River at crossing of Apache County Road No. 124 | | | |
| Total phosphorus | NNS | NNS | 0.75 |
| Total nitrogen | NNS | NNS | 1.80 |
| 8. Little Colorado River above Lyman Lake to above Amity Ditch diversion near crossing of Arizona Highway 273:
(applies only when in-stream turbidity is less than 50 NTU) | | | |
| Total phosphorus | 0.20 | 0.30 | 0.75 |
| Total nitrogen | 0.70 | 1.20 | 1.50 |
| 9. Colorado River, at Northern International Boundary near Morelos Dam | | | |
| Total phosphorus | NNS | 0.33 | NNS |
| Total nitrogen | NNS | 2.50 | NNS |
| 10. San Pedro River, from Curtis to Benson: | | | |
| Total phosphorus | NNS | NNS | NNS |
| Total nitrogen as N | NNS | NNS | 10.00 |
| 11. <u>The discharge of wastewater to Show Low Creek and tributaries upstream of and including Fools Hollow Lake shall not exceed 0.16 mg/l total phosphates as P.</u> | | | |
| 12. <u>The discharge of wastewater to the San Francisco River and tributaries upstream of Luna Lake Dam shall not exceed 1.0 mg/l total phosphates as P.</u> | | | |
| I. The following water quality standards for radiochemicals shall not be exceeded: | | | |
| 1. In all surface waters, the concentration of radiochemicals shall not exceed the limits established by the Arizona Radiation Regulatory Agency in 12 A.A.C.1, Article 4, | | | |

Appendix A, Table II, Column 2, (effective June 30, 1997 and no future amendments), which is incorporated by reference and on file with the Office of the Secretary of State and with the Department.

2. In surface waters that are designated as domestic water sources, the following waste quality standards for radiochemicals shall not be exceeded:

- a. The concentration of gross alpha particle activity, including radium-226 but excluding radon and uranium, shall not exceed 15 picocuries per liter of water.
- b. The concentration of combined radium-226 and radium-228 shall not exceed 5 picocuries per liter of water.
- c. The concentration of strontium-90 shall not exceed 8 picocuries per liter of water.
- d. The concentration of tritium shall not exceed 20,000 picocuries per liter of water.
- e. The average annual concentration of beta particle activity and photon emitters from man-made radionuclides shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirems per year.

R18-11-110. Salinity of the Colorado River - No changes; EPA concluded no effect.

R18-11-111. Analytic methods - modified rule

A. Analysis of a sample taken to determine compliance with a water quality standard shall be in accordance with an approved analytical method in A.A.C.14, Article 6 or an alternative analytic method that is approved by the Director of the Department of Health Services pursuant to A.A.C. R9-14-607(B).

B. A test result from a sample taken to determine compliance with a water quality standard shall be valid only if the sample has been analyzed by a laboratory that is licensed by the Arizona Department of Health Services for the analysis performed.

R18-11-112. Unique waters - modified rule

A. The classification of a surface water as a unique water shall be by rule.

B. The Director may adopt, by rule, site-specific water quality.

C. Any person may nominate a surface water for classification as a unique water by filing a petition for rule adoption with the Department. A petition for rule adoption to classify a surface water as a unique water shall include:

1. A map and a description of the surface water;
2. A written statement in support of the nomination, including specific reference to the applicable criteria for unique waters classification as prescribed in Subsection D of this section;
3. Supporting evidence demonstrating that one or more of the applicable unique waters criteria prescribed in Subsection D of this Section has been met; and
4. Relevant water quality data. Available water quality data relevant to establishing baseline water quality of the proposed unique water.

D. A surface water may be classified as a unique water by the Director upon a finding that the surface water is an outstanding state resource water based upon 1 of the following criteria:

1. The surface water is of exceptional recreational or ecological significance because of its unique attributes, including but not limited to, attributes related to the geology, flora, fauna, water quality, aesthetic values, or the wilderness characteristics of the surface waste.

2. Threatened or endangered species are known to be associated with the surface waste and the existing water quality is essential to the maintenance and propagation of a threatened or endangered species or the surface water provides critical habitat for a threatened or endangered species. Endangered or threatened species are identified on the following lists which are hereby incorporated by reference and on file with the Office of the Secretary of State and with the Department:

- a. Endangered and Threatened Wildlife and Plants, 50 CFR, §§ 17.11 and 17.12.
- b. Threatened Native Wildlife of Arizona, Arizona Game and Fish Department.
- c. List of highly safeguarded native plants in 3 A.A.C.4.

E. The following surface waters are classified as unique waters:

- 1. The West Fork of the Little Colorado River, above Government Springs;
- 2. Oak Creek, including the West Fork of Oak Creek;
- 3. Peeples Canyon Creek, tributary to Santa Maria River;
- 4. Burro Creek, above its confluence with Boulder Creek;
- 5. Francis Creek, Mohave and Yavapai counties;
- 6. Bonita Creek, tributary to the upper Gila River;
- 7. Cienega Creek, from I-10 bridge to Del Lago Dam, Pima County;
- 8. Aravaipa Creek, from confluence of Stowe Gulch to the downstream boundary of the Aravaipa Canyon Wilderness Area;
- 9. Cave Creek and South Fork of Cave Creek [Chiricahua Mountains], from headwaters to the Coronado National Forest boundary; and
- 10. Buehman Canyon Creek, from headwaters approximately 9.8 miles downstream.

F. The following water quality standards apply to the listed unique waters. Water quality standards prescribed in this subsection supplement ~~or supersede~~ the water quality standards prescribed pursuant to R18-11-109.

1. The West Fork of the Little Colorado River, above Government Springs:

Parameter	Standard
Fecal Coliform	200 cfu/100 ml
pH	no change due to discharge
Temperature	no increase due to discharge
Dissolved oxygen	no decrease due to discharge
Total dissolved solids	no increase due to discharge
Chromium	10 micrograms per liter
Zinc	110 micrograms per liter

2. Oak Creek, including the West Fork of Oak Creek:

Parameter	Standard
Fecal Coliform	150 cfu/100 ml
Nitrogen	1.00 mg/L (annual mean)
	1.50 mg/L

Phosphorus	2.5 mg/L (single sample max.) 0.10 mg/L (annual mean) 0.25 mg/L (90th percentile) 0.30 mg/L (single sample max.)
Chromium	0.30 mg/L (single sample max.)
Zinc	5 micrograms per liter
Turbidity change due to discharge	3 NTU

3. Peeples Canyon Creek, tributary to Santa Maria River:

Parameter	Standard
Temperature	No increase due to discharge no decrease due to discharge
Dissolved oxygen	
Turbidity change due to discharge	5 NTU
Arsenic (T)	20 micrograms/L
Manganese	500 micrograms/L

4. Burro Creek, above its confluence with Boulder Creek:

Parameter	Standard
Fecal Coliform	500 cfu/100 ml
Manganese (T)	500 micrograms/L

5. Francis Creek, Mohave and Yavapai Counties:

Parameter	Standard
Fecal Coliform	500 cfu/100 ml
Manganese (T)	500 micrograms

6. Cienega Creek, from I-10 bridge to Del Lago Dam, Pima County:

Parameter	Standard
pH	<u>no change due to discharge</u>
Temperature	<u>no increase due to discharge</u>
Dissolved oxygen	<u>no decrease due to discharge</u>
Total dissolved solids	<u>no increase due to discharge</u>
Turbidity	<u>10 NTU</u>

7. Bonita Creek, tributary to the Upper Gila River:

Parameter	Standard
pH	<u>no change due to discharge</u>
Temperature	<u>no increase due to discharge</u>
Dissolved oxygen	<u>no decrease due to discharge</u>
Total dissolved solids	<u>no increase due to discharge</u>

Turbidity15 NTU

R18-11-113. Effluent ~~dominated~~ dependent waters - modified rule

A. The classification of a surface water as an effluent ~~dominated~~ dependent water shall be by rule.

B. The Director may adopt, by rule, site-specific water quality standards for an effluent ~~dominated~~ dependent water.

C. Any person may submit a petition for rule adoption requesting that the Director classify a surface water as an effluent ~~dominated~~ dependent water. The petition for rule adoption shall include:

1. A map and description of the surface water.
2. Information that demonstrates that the surface water consists primarily of discharges of treated water.

D. The following surface waters are classified as effluent ~~dominated~~ dependent waters:

1. In the Colorado River Main Stem Basin:
 - a. Bright Angel Wash from South Rim Grand Canyon wastewater treatment plant outfall to confluence with Cataract Creek Coconino Wash.
 - b. Cataract Creek from Williams WWTP outfall to ~~3 kilometers~~ 1 kilometer downstream from the outfall.
 - c. Holy Moses Wash from Kingman WWTP outfall to ~~5 3~~ 3 kilometers downstream from the outfall.
 - d. ~~Unnamed wash, tributary to Bright Angel Creek, from Grand Canyon North Rim WWTP Transept Canyon from North Rim Grand Canyon WWTP outfall to 1 kilometer downstream from the outfall.~~
2. In the Little Colorado River Basin
 - a. ~~Black Creek from Ft. Defiance WWTP outfall to the confluence with Rio Puerco River.~~
 - a. Dry Lake
 - b. Lake Humphreys
 - c. Lower Walnut Canyon Lake
 - d. Ned Lake
 - e. Pintail Lake
 - f. Telephone Lake
 - g. Rio de Flag from City of Flagstaff WWTP outfall to confluence with ~~Little Colorado River~~ San Francisco Wash.
 - h. ~~Telephone Lake~~ Whale Lake
3. In the Middle Gila River Basin:
 - a. ~~Agua Fria River from Surprise WWTP outfall to 5 kilometers downstream from the outfall.~~
 - a. Unnamed wash from the Town of Prescott Valley WWTP outfall to the confluence with the Agua Fria River, and the Agua Fria River below the confluence with the unnamed wash receiving treated wastewater from the Prescott Valley WWTP to State Route 169.

- b. Agua Fria River from El Mirage WWTP outfall to 8 2 kilometers downstream from the outfall.
 - ~~c. Agua Fria River from Avondale WWTP outfall to confluence with the Gila River.~~
 - c. Gila River from Florence WWTP outfall to 5 kilometers downstream from the outfall Felix Road.
 - d. Gila River from confluence with the Salt River to Gillespie Dam.
 - e. Queen Creek from Superior ~~WWTP~~ Mining Division discharge outfall to 8 kilometers downstream from the outfall confluence with Potts Canyon.
 - f. Unnamed wash from Gila Bend WWTP outfall to confluence with Gila River.
 - g. Unnamed wash from Luke AFB WWTP outfall to the confluence with Agua Fria River.
 - h. Unnamed wash from Queen Valley WWTP outfall to 3 kilometers downstream from the confluence with Queen Creek.
4. In the Rios de Mexico Basin:
- a. Mule Gulch, from Bisbee WWTP outfall to confluence with Whitewater Draw.
 - b. Unnamed wash from Bisbee-Douglas International Airport WWTP outfall to Whitewater Draw.
5. In the Salt River Basin:
- a. ~~Pinal Creek from Globe WWTP outfall to 5 kilometers downstream from the outfall.~~
Unnamed wash from Globe WWTP outfall to confluence with Pinal Creek and from confluence of unnamed wash and Pinal Creek to Radium.
 - b. Salt River from 23rd Avenue WWTP outfall to confluence with the Gila River.
6. In the San Pedro River Basin:
- a. ~~Unnamed wash from Oracle WTP outfall to confluence with Big Wash. Unnamed wash from Mt. Lemmon WWTP outfall to 0.25 kilometers downstream.~~
 - b. Walnut Gulch from Tombstone WWTP outfall to confluence with the San Pedro River Tombstone Gulch.
7. In the Santa Cruz River Basin:
- a. ~~North Branch of the Santa Cruz Wash from the Casa Grande WWTP outfall to confluence with the Santa Cruz Wash.~~
 - a. Santa Cruz River from City of Nogales ~~WWTP~~ Nogales International WWTP outfall to ~~Josephine Canyon~~ Tubac Bridge.
 - b. Santa Cruz River from Roger Road WWTP outfall to Baumgartner Road crossing.
 - c. Unnamed wash from Oracle WWTP outfall to 5 kilometers downstream.
 - d. Sonoita Creek from Town of Patagonia WWTP outfall to 750 feet downstream.
8. In the Upper Gila River Basin:
- a. Bennett Wash from Arizona Department of Corrections Globe WWTP outfall to 3 kilometers downstream from the outfall the boundary of the San Carlos Indian Reservation.
9. In the Verde River Basin:
- a. American Gulch from ~~Payson~~ Northern Gila County Sanitary District WWTP outfall to the East Verde River.
 - b. Bitter Creek from Jerome WWTP outfall to 2.5 kilometers downstream from the outfall.

c. Jacks Canyon Wash from Big Park WWTP outfall to confluence with Dry Beaver Creek.

E. The water quality standards that apply to an effluent dependent water shall be used to derive discharge limitations for a point source discharge from a wastewater treatment plant to an ephemeral water which changes that ephemeral water into an effluent dependent water.

R18-11-114. Mixing Zones - modified rule

A. The Director may, by order, establish a mixing zone in a surface water. Mixing zones are prohibited in ephemeral waters or where there is no water for dilution.

B. The owner or operator of a point source seeking the establishment of a mixing zone shall submit a mixing zone application to the Department on a standard form that is available from the Department. The application shall include:

1. Identification of the pollutant for which the mixing zone is requested;
2. A proposed outfall design;
3. A definition of the boundary of the proposed mixing zone.
4. A complete and detailed description of the existing physical, biological, and chemical conditions of the receiving water and of the predicted impact on such conditions from the proposed mixing zones.
5. Information which demonstrates that there will be no acute toxicity in the proposed mixing zone.

R18-11-115. Nutrient waivers - modified rule

A. The water quality standards for total phosphorus and total nitrogen may be waived on a discharger-specific basis for a discharge to an ephemeral water which is tributary to a surface water for which water quality standards for total nitrogen or total phosphorus are prescribed in A.A.C. ~~R18-11-109.G~~ R18-11-109(H).

B. A discharger who seeks a nutrient waiver shall submit an application to the Department on a standards form that is available from the Department. The application shall include:

1. Identification of the applicant.
2. Information on the discharging facility, including:
 - a. Date the facility was placed in service;
 - b. Location of the facility;
 - c. Location of the discharge point;
 - d. Wastewater treatment method; and
 - e. Discharge flow.
3. Information on the receiving surface water, including:
 - a. Name of the receiving water;
 - ~~b. Months of the year the receiving water is normally dry;~~
 - b. Distance in river miles to the nearest downstream ~~navigable~~ surface water with perennial flow; and

c. Distance from the point of discharge to the point where the flow goes subsurface during an average dry season.

4. Information which demonstrates that the ~~navigable water~~ nearest downstream surface water is free from pollutants in amounts or combinations which cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth or propagation of other aquatic life or that impair recreational uses.

5. Water quality data, including:

- a. Monthly average, 90th percentile and single sample maximum concentrations of total phosphorus and total nitrogen as measured at the point of discharge;
- b. Monthly average, 90th percentile and single sample maximum concentrations of total phosphorus and total nitrogen as measured at a downstream control point established by the Department; and
- c. Discharge flow at the time of sampling.

C. The Department shall review the application for completeness and shall notify the applicant in writing whether the application is complete or whether additional information needs to be submitted to the Department.

D. Once an application for a nutrient waiver is complete, the Department shall make a preliminary determination of whether to grant or deny the nutrient waiver. The Department shall issue public notice and ~~conduct~~ provide an opportunity for a public hearing on whether the request for a nutrient waiver should be granted pursuant to procedures prescribed in A.A.C. R18-1-401 and A.A.C. R18-1-402.

E. The Director may, by order, grant a nutrient waiver provided the discharge will not cause a violation of a water quality standard for total phosphorus or total nitrogen in any downstream, ~~perennial navigable~~ surface water or cause a violation of narrative standards prescribed in R18-11-108. A copy of the Director's decision and order shall be sent by certified mail to the applicant.

F. Any person who is adversely affected by an order granting or denying a nutrient waiver may appeal the decision to an administrative law judge pursuant to A.R.S. §49-321.

G. A nutrient waiver shall be for a fixed term not to exceed five years. A nutrient waiver shall be reevaluated upon issuance, reissuance or modification of the National Pollutant Discharge Elimination System permit for the point source.

R18-11-116. Resource Management Agencies - No changes; EPA concluded no effect.

R18-11-117. Canals and municipal park lakes - No changes; EPA concluded no effect.

R18-11-118. Dams and Flood Control Structures - Modified rule

- A. Increases in turbidity that result from the routine physical or mechanical maintenance of dams and flood control structures shall not be construed as violations of this Article.
- B. Nothing in this Article shall be construed to require a person who operates a dam or flood control structure to operate such structure so as to cure or mitigate an exceedence of a water quality standard caused by another person.
- C. Nothing in this Article shall be construed to require the release of water from dams.

R18-11-119. Natural Background - No changes.

Where the concentration of a pollutant exceeds a water quality standard and the exceedence is not caused by human activity but is due solely to naturally-occurring conditions, the exceedence shall not be considered a violation of the water quality standard.

R18-11-120. Enforcement - Modified rule

- A. Any person who causes a violation of a water quality standard or any provision of this Article is subject to the enforcement provisions prescribed in A.R.S. Title 49, Chapter 2, Article 4.
- B. A numeric water quality standard may be established at a concentration that is below the practical quantitation limit. In such cases, the water quality standard is enforceable at the practical quantitation limit. ~~The applicable practical quantitation limits are prescribed in Appendix C of this Article.~~
- C. Compliance with acute aquatic and wildlife criteria shall be determined from the analytical test result of ~~either a one-hour composite sample or a grab sample.~~
- D. A person is not subject to penalties for violation of a water quality standard provided that such person is in compliance with the provisions of a compliance schedule issued pursuant to R18-11-121.

R18-11-121. Schedules of compliance - Modified rule

- A. A schedule to bring an existing point source into compliance with a new or revised water quality standard ~~adopted after August 13, 1986~~ may be established in a NPDES permit. A compliance schedule for an existing point source, other than a stormwater discharge, shall require compliance with a discharge limitation based upon a new or revised water quality standard no later than three years after the effective date of the ~~water quality standard~~ NPDES permit. In order for a schedule of compliance to be granted, the owner or operator of the existing point source shall demonstrate that all requirements under §301(b) and §306 of the Clean Water Act have been achieved and that the point source cannot comply with a discharge limitation based upon the new or revised water quality standard through the application of existing water pollution control technology, operational changes or source reduction.
- B. A schedule of compliance shall not be established in a NPDES permit for a new point source. For purposes of this subsection, a new point source means a point source, the construction of which commences after the effective date of a water quality standard. Commencement of construction means that the owner or operator of the point source has obtain the federal, state and local approvals or permits necessary to begin physical construction of the point source and either:
 1. On site physical construction program has begun; or
 2. The owner or operator has entered into a contract for physical construction of the point source

and the contract cannot be canceled or modified without substantial loss. For purposes of this paragraph, "substantial loss" means in excess of ten percent of the total cost incurred for physical construction.

C. A schedule to bring a point source discharge of storm water into compliance with a water quality standard may be established in a NPDES permit. A compliance schedule for a storm water discharge shall require implementation of all reasonable and cost effective best management practices to control the discharge of pollutants in storm water. ~~A compliance schedule shall require compliance with a water quality standard but no later than ten years after the effective date of the water quality standard.~~

R18-11-122. Variances - New rule

A. The Director may grant a variance from a water quality standard for a point source discharge provided the discharger demonstrates one of the following:

1. That the treatment more advanced than that required to comply with technology-based effluent limitations is necessary to achieve compliance with the water quality standards and it is not technically feasible to achieve compliance within the next five years; or

2. The treatment more advanced than that required to comply with technology-based effluent limitations is necessary to achieve compliance with the water quality standard and the cost of such treatment would result in substantial and widespread economic and social impact.

B. A variance may be granted only on a pollutant-specific basis. A point source discharge is required to comply with all other applicable water quality standards for which a variance is not granted.

C. A variance applies only to a specific point source discharge. The granting of a variance does not modify a water quality standard. Other point source discharges to the surface water are required to comply with applicable water quality standards, including any water quality standard for which a variance has been granted for a specific point source discharge.

D. A variance shall be a fixed term not to exceed five years. Upon expiration of a variance a point source discharger shall either comply with the water quality standard or apply for renewal of the variance. In order for a variance to be renewed, the applicant shall demonstrate that reasonable progress towards achieving compliance with the water quality standard has been made during the term of the variance.

E. A variance shall be reevaluated upon the issuance, reissuance or modification of the NPDES permit for the point source discharge.

F. A person who seeks a variance from a water quality standard shall submit a letter to the Department requesting a variance. A request for a variance shall include the following information:

1. Identification of the specific pollutant and water quality standard for which a variance is sought;

2. Identification of the receiving water;

3. For an existing point source discharge, a detailed description of the existing discharge control technologies that will be used to achieve compliance with applicable water quality standards. For a new point source discharge, a detailed description of the proposed discharge

control technologies that will be used to achieve compliance with applicable water quality standards;

4. Documentation that the existing or proposed discharge control technologies will comply with applicable technology-based effluent limitations and that more advanced treatment technology is necessary to achieve compliance with the water quality standard for which a variance is sought;

5. A detailed discussion of the reasons why compliance with the water quality standard cannot be achieved;

6. A detailed discussion of the discharge control technologies that are available for achieving compliance with the water quality standard for which a variance is sought;

7. Documentation of one or both of the following:

a. That it is not technically feasible to install and operate any of the available discharge control technologies to achieve compliance with the water quality standard for which a variance is sought; or

b. That installation and operation of each of the available discharge technologies to achieve compliance with the water quality standard would result in substantial and widespread economic and social impact;

8. Documentation that the point source discharger has reduced, to the maximum extent practicable, the discharge of the pollutant for which a variance is sought through implementation of a local pretreatment, source reduction, or waste minimization program;

9. A person who requests a variance shall propose interim discharge limitations which represent the highest level of treatment achievable by the point source discharge during the term of the variance. Interim discharge limitations shall not be less stringent than technology-based effluent limitations.

G. In making a decision on whether to grant or deny the request for a variance, the Director shall consider the following factors: Bioaccumulation, bioconcentration, predicted exposure of biota and the likelihood that resident biota will be adversely affected, the known or predicted safe exposure levels for the pollutant of concern, and the likelihood of adverse human health effects.

H. The Department shall issue public notice and shall provide an opportunity for a public hearing on whether the request for a variance should be granted or denied pursuant to procedures prescribed.

I. Any person who is adversely affected by a decision of the Director to grant or deny a variance may appeal the decision to an administrative law judge.

J. Variances shall not be granted for a point source discharge to a unique water listed in R18-11-112.

K. A variance is subject to review and approval by the Regional Administrator of the U.S. Environmental Protection Agency.

R18-11-123. Prohibition against discharge; Sabino Creek - New rule; EPA concluded no effect.

Appendix A - Numeric water quality criteria

Table 2. Aquatic and Wildlife Designated Use Numeric Water Quality Criteria (enclosed)

Appendix B - List of Surface Waters and Designated Uses

The designated uses of navigable waters are identified in the Table can be found in the 1996 water quality standards. If a navigable water has more than one designated use, the most stringent criterion must be applied.

Appendix C - Practical Quantitation Levels - Rule repealed

STATUS OF THE SPECIES

Species and critical habitat designations are considered in this consultation are divided into two lists. List A includes those species discussed in detail in the biological opinion issued February 16, 1994. Information on their status and distribution can be found in that document. List B includes those species listed since the 1994 biological opinion and are discussed in detail below.

List A - Species considered for the revised rules

Apache trout (Oncorhynchus apache) Threatened
 *Beautiful shiner (Cyprinella formosa) Threatened
 *Bonytail chub (Gila elegans) Endangered
 Colorado squawfish (Ptychocheilus lucius) Endangered
 *Desert pupfish (Cyprinodon macularius) Endangered
 Gila topminnow (Poeciliopsis occidentalis occidentalis) Endangered
 Gila trout (Oncorhynchus gilae) Endangered
 *Humpback chub (Gila cypha) Endangered
 *Little Colorado spinedace (Lepidomeda vittata) Threatened
 Loach minnow (Tiaroga cobitis) Threatened
 *Razorback sucker (Xyrauchen texanus) Endangered
 *Sonora chub (Gila ditaenia) Threatened
 Spikedace (Meda fulgida) Threatened
 Virgin River chub (Gila robusta seminuda) Endangered
 Woundfin (Plagopterus argentissimus) Endangered
 *Yaqui catfish (Ictalurus pricei) Threatened
 *Yaqui chub (Gila purpurea) Endangered
 Yaqui topminnow (Poeciliopsis occidentalis sonoriensis) Endangered
 Bald eagle (Haliaeetus leucocephalus) Threatened
 Yuma clapper rail (Rallus longirostris yumanensis) Endangered
 Brown pelican (Pelecanus occidentalis) Endangered

List B - Species considered for the new rules

Canelo Hills ladies'-tresses (Spiranthes delitescens) Endangered
 Huachuca water umbel (Lilaeopsis schaffneriana ssp. recurva) Endangered
 Sonora tiger salamander (Ambystoma tigrinum stebbinsi) Endangered
 *Southwestern willow flycatcher (Empidonax traillii extimus) Endangered

*Species with proposed or designated critical habitat.

STATUS OF THE SPECIES

Canelo Hills ladies'-tresses

The Canelo Hills ladies' tresses (*Spiranthes delitescens*) was listed as endangered pursuant to the Endangered Species Act of 1973, as amended, on February 5, 1997 (USFWS 1997). The species is known to occur in a limited number of wetland communities known as cienegas in southern Arizona. No critical habitat has been designated.

The Canelo Hills ladies' tresses is a slender, erect, terrestrial orchid that reaches a height of approximately 50 centimeters (cm) when flowering. Five to 10 linear-lanceolate, grass-like leaves grow basally on the stem and can reach 18 cm in length and 1.5 cm in width. The roots are fleshy and swollen reaching approximately 0.5 cm in diameter. The top of the flower stalk contains up to 40 small white flowers arranged in a spiral. The species is thought to be perennial although mature plants rarely flower in consecutive years and often have no visible above ground structures (McClaran and Sundt 1992, Newman 1991). The species was first collected and described from a site in Santa Cruz County, Arizona in 1968 and was initially thought to be *S. graminea* a related Mexican orchid (Sheviak 1990). However, Sheviak (1990) found that this species exhibited a distinct set of morphological and cytological characteristics and renamed the species *S. delitescens*. The species is known from only five sites in the San Pedro River watershed in Santa Cruz and Cochise Counties, Arizona (Newman 1991). The total amount of occupied habitat is less than 200 acres. One site occurs on Forest Service land and the other four sites are all on private property less than 23 miles north of the Mexican border. Potential habitat exists in Sonora but surveys have not located any populations (Newman, 1991).

Other plant species associated with *Spiranthes* include sedges (*Carex* spp.), rushes (*Juncus* spp.), spike rush (*Eleocharis* spp.), cattails (*Typha* spp.), horsetails (*Equisetum* spp.) and several grass species including bluegrass (*Poa pratensis*), Johnson grass (*Sorghum halepense*), and Muhlys (*Muhlenbergia* spp.) (Cross 1991, Warren 1991, Fishbein and Gori 1994). Adjacent upland areas are typically semidesert grassland or oak savannah. All populations of *Spiranthes* occur in areas where scouring floods are unlikely (Newman 1991). Soils that support *Spiranthes* are highly organic and are seasonally or perennially saturated. Springs are the primary source of water supporting the species, but one locality is supported by near surface groundwater fed by a nearby creek (McClaran and Sundt 1992). Successful seedling establishment is probably dependent upon the formation of endomycorrhizae, a symbiotic relationship between fungi and plant root tissue (McClaran and Sundt 1992). Time needed for subterranean structures to produce terrestrial growth is unknown. Plants may remain in a non-flowering dormant, subterranean state for more than one consecutive year. Plants can flower one year then become dormant, vegetative, or reproductive the following year (McClaran and Sundt 1992, Newman 1991).

Estimating population size and stability is problematic because non-flowering plants are difficult

to locate in dense vegetative cover. Annual inventories tend to underestimate population size because dormant plants are not counted. However, monitoring in 1991 showed the population of at least one site had been reduced to one nonflowering plant, and overall population numbers are believed to be declining (Newman 1991, McClaran and Sundt 1992).

The primary cause of species decline has been attributed to habitat loss and degradation. The Canelo Hills ladies' tresses is a wetland obligate plant species. Cienegas, perennial streams, and riparian areas have become extremely rare. The State of Arizona has estimated that nearly 90% of riparian communities have been either altered, degraded or destroyed as a result of man's activities (Lofgren et al 1990). Factors that have contributed to habitat degradation and loss in the San Pedro watershed include groundwater overdrafts, surface water diversions, impoundments, channelization, poorly managed livestock grazing, agriculture, mining, invasion of exotic plant species, and recreational activities. In the late 1800's some of these activities coupled with above average precipitation and flooding contributed to widespread erosion and channel downcutting along the San Pedro River (Bahre 1991, Bryan 1925, Dobyns 1981, Hastings and Turner 1980, Hendrickson and Minckley 1984, Martin 1975, Sheridan 1986, Webb and Betancourt 1992). These events led to a long-term or permanent loss of cienega and riparian communities throughout southern Arizona and northern Mexico. By the mid 1890's the grasslands and cienegas that were once widespread in the San Rafael Valley had disappeared or had become highly localized (Hadley and Sheridan 1995). The effects of this degradation still persists today and some areas may never recover. Most of these human activities are ongoing and are expected to increase as regional human populations continue to grow. The orchid is also potentially threatened by its appeal to plant collectors.

Huachuca water umbel

The Huachuca water umbel was listed as an endangered species on January 6, 1997. No critical habitat has been proposed or designated. The umbel is an herbaceous, semiaquatic perennial plant with slender, erect leaves that grow from creeping rhizomes. The leaves are cylindrical, hollow with no pith, and have septa (thin partitions) at regular intervals. The yellow/green or bright green leaves are generally 0.04-0.12 inches (in.) in diameter and often one to two in. tall, but can reach up to eight in. tall under favorable conditions. Three to 10 very small flowers are borne on an umbel that is always shorter than the leaves. The fruits are globose, 0.06-0.08 in. in diameter, and usually slightly longer than wide (Affolter 1985). The species reproduces sexually through flowering and asexually from rhizomes, the latter probably being the primary reproductive mode. An additional dispersal opportunity occurs as a result of the dislodging of clumps of plants which then may re-root in a different site along aquatic systems.

Huachuca water umbel was described based on the specimen collected near Tucson in 1881 (Hill 1926). Hill applied the name Lilaeopsis recurva to the specimen, and the name prevailed until Affolter (1985) revised the genus. Affolter applied the name L. schaffneriana ssp. recurva to plants found west of the continental divide.

Huachuca water umbel has been documented from 23 sites in Santa Cruz, Cochise, and Pima counties, Arizona, and in adjacent Sonora, Mexico, west of the continental divide (Saucedo 1990, Warren et al. 1989, Warren et al. 1991, Warren and Reichenbacher 1991, Service files). The plant has been extirpated from six of the 23 sites. The 17 extant sites occur in four major watersheds - San Pedro River, Santa Cruz River, Rio Yaqui, and Rio Sonora, between 3,500 and 6,500 ft elevation.

Huachuca water umbel has an opportunistic strategy that ensures its survival in healthy riverine systems, cienegas, and springs. In upper watersheds that generally do not experience scouring floods, the umbel occurs in microsites where interspecific plant competition is low. At these sites, the umbel occurs on wetted soils interspersed with other plants at low density, along the periphery of the wetted channel, or in small openings in the understory. The upper Santa Cruz River and associated springs in the San Rafael Valley, where a population of Huachuca water umbel occurs, is an example of a site that meets these conditions. The types of microsites required by the umbel were generally lost from the main stems of the San Pedro and Santa Cruz rivers when channel entrenchment occurred in the late 1800's. Habitat on the upper San Pedro River is recovering, and Huachuca water umbel has recently been found along short reaches of the main channel.

In stream and river habitats, Huachuca water umbel can occur in backwaters, side channels, and nearby springs. After a flood, it can rapidly expand and occupy disturbed habitat until interspecific competition exceeds its tolerance. This response was recorded at Sonoita Creek in August 1988, when a scouring flood removed about 95 percent of the Huachuca water umbel population (Gori et al. 1990). One year later, the umbel had recolonized the stream and was again codominant with watercress, Rorippa nasturtium-aquaticum (Warren et al. 1991). The expansion and contraction of Huachuca water umbel populations appears to depend on the presence of ``refugia'' where the species can escape the effects of scouring floods, a watershed that has an unaltered hydrograph, and a healthy riparian community that stabilizes the channel.

Density of umbel plants and size of populations fluctuate in response to both flood cycles and site characteristics. Some sites, such as Black Draw, have a few sparsely-distributed clones, possibly due to the dense shade of the even-aged overstory of trees, dense nonnative herbaceous layer beneath the canopy, and deeply entrenched channel. The Sonoita Creek population occupies 14.5 percent of a 5,385 ft² patch of habitat (Gori et al. 1990). Some populations are as small as 11-22 ft². The Scotia Canyon population, by contrast, has dense mats of leaves. Scotia Canyon contains one of the larger Huachuca water umbel populations, occupying about 57 percent of the 1,450 m (4,756 ft) perennial reach (Gori et al. 1990; Jim Abbott, Coronado National Forest, Tucson, AZ, in litt. 1994). The number of individuals in each population is difficult to determine because of the intermeshing nature of the creeping rhizomes and the predominantly asexual mode of reproduction.

Overgrazing, mining, hay harvesting, timber harvest, fire suppression, and other activities in the nineteenth century led to widespread erosion and channel entrenchment in southeastern Arizona

streams and cienegas when above-average precipitation and flooding occurred in the late 1800's (Bahre 1991, Bryan 1925, Dobyns 1981, Hastings and Turner 1980, Hendrickson and Minckley 1984, Martin 1975, Sheridan 1986, Webb and Betancourt 1992). These events contributed to long-term or permanent degradation and loss of cienega and riparian habitat throughout southern Arizona and northern Mexico. Much habitat of the Huachuca water umbel and other cienega-dependent species was presumably lost at that time.

Wetland degradation and loss continues today. Human activities such as groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, chaining, agriculture, mining, sand and gravel operations, road building, nonnative species introductions, urbanization, wood cutting, and recreation all contribute to riparian and cienega habitat loss and degradation in southern Arizona. The local and regional effects of these activities are expected to increase with the increasing human population.

Dredging extirpated the Huachuca water umbel from House Pond, near the extant population in Black Draw (Warren et al. 1991). The umbel population at Zinn Pond in St. David near the San Pedro River was probably lost when the pond was dredged and deepened. This population was last documented in 1953 (Warren et al. 1991).

Groundwater pumping has eliminated habitat in the Santa Cruz river north of Tubac, and threatens habitat in the San Pedro River. Severe recreational impacts in unmanaged areas can compact soils, destabilize stream banks, and decrease riparian plant density, including densities of the Huachuca water umbel. Populations in Bear Canyon in the Huachuca Mountains have been impacted by trampling and off-highway vehicles.

A suite of nonnative plant species has invaded wetland habitats occupied by the Huachuca water umbel. In some cases their effect on the umbel is unclear. However, in certain microsites, the nonnative Bermuda grass, *Cynodon dactylon*, may directly compete with the umbel. Bermuda grass forms a thick sod in which many native plants are unable to establish. Watercress is another nonnative plant now abundant along perennial streams in Arizona. It is successful in disturbed areas and can form dense monocultures that can outcompete Huachuca water umbel populations.

Sonora tiger salamander

This Sonora tiger salamander was listed as endangered species on January 6, 1997, and is known from 44 breeding localities in the San Rafael Valley and adjoining foothills of the east slope of the Patagonia and Huachuca Mountains, and also on Fort Huachuca (Abbate 1998, USFWS 1997, Collins and Jones 1987, Collins 1996). Of these sites, no salamanders were found at four tanks during the last three visits from 1993 to 1996, nor since the mid or early 1980's. Salamanders are probably extirpated from these sites. Salamanders were also found to be extirpated from the J.F. Jones Ranch Tank, the type locality (Collins and Jones 1987). Salamanders were not found during the last three visits from 1993 through 1996 at five other tanks. Salamanders may be extirpated from these sites. Another three sites where salamanders were found from 1980 to 1983 have not

been surveyed since that time. The status of populations at these tanks is unknown.

Primary threats to the salamander include predation by non-native fish and bullfrogs, disease, catastrophic floods and drought, illegal collecting, introduction of other subspecies of salamanders that could genetically swamp Sonora tiger salamander populations, and stochastic extirpations or extinction characteristic of small populations. The disease has recently been identified as a virus, possibly an iridiovirus, that once introduced to a stock tank, most or all aquatic salamanders die. The disease may be spread by bullfrogs, birds, or other animals that move among tanks (Snyder et al. 1998). Diseased salamanders were found at two tanks in 1997 (Abbate 1998). With the exception of Bog Hole in the San Rafael Valley and a site on Fort Huachuca, cattle grazing occurs throughout the range of the Sonora tiger salamander. Cattle can degrade habitat at stock tank breeding sites and overgrazing can cause loss of cover and erosion that can threaten the integrity of stock tanks used by the salamander. Salamanders have been found at 31 tanks during one or more of the last three visits from 1993 through 1996, in Santa Cruz and Cochise counties. During intensive surveys in 1997, between one and 150 Sonora tiger salamanders were found at 25 stock tanks (Abbate 1998). Salamanders that may be Sonora tiger salamanders have also been found at the lower Peterson Ranch tank in Scotia Canyon and at Los Fresnos in the San Rafael Valley, Sonora. Salamanders have not been found at the Scotia Canyon site for at least a year; this population may be extirpated.

Southwestern willow flycatcher

The southwestern willow flycatcher (*Empidonax traillii extimus*) is a small passerine bird measuring approximately 15 centimeters (5.75 inches) in length from the tip of the bill to the tip of the tail and weighing only 11 grams (0.4 ounces). It has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark, the lower is light yellow grading to black at the tip.

One of four currently-recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993), the southwestern willow flycatcher is a neotropical migratory species that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical range of the southwestern willow flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja; Unitt 1987).

The State of Arizona considers the southwestern willow flycatcher a species of special concern (AGFD 1996). The Service included the southwestern willow flycatcher on its Animal Notice of Review as a category 2 candidate species on January 6, 1989 (USFWS 1989). A proposal to list the southwestern willow flycatcher as endangered, with critical habitat, was published on July 23, 1993 (USFWS 1993), and a final rule without critical habitat was published on February 27, 1995

(USFWS 1995), becoming effective on March 29, 1995. Following the review of comments received during the public comment period, the Service deferred the designation of critical habitat, invoking an extension on this decision until July 23, 1995. A moratorium on listing actions under the Act passed by Congress in April 1995 required the Service to cease work on the designation of critical habitat. On April 26, 1996, the moratorium was lifted and on May 16, 1996, the Service published a notice in the Federal Register announcing listing prioritization guidance. On May 13, 1997, the Southwest Center for Biological Diversity filed a lawsuit claiming that the Service violated the Act by not finalizing critical habitat for the southwestern willow flycatcher. On March 20, 1997, the District Court ordered the Service to finalize critical habitat for the flycatcher by July 18, 1997. As ordered, the critical habitat was published on July 18, 1997, and became effective on August 21, 1997. A correction notice was published in the Federal Register on August 20, 1997.

Life History

The southwestern willow flycatcher forages within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage (Wheelock 1912, Bent 1963). No information is available on specific prey species. However, fecal samples containing identifiable invertebrate body parts were collected during banding operations from more than 70 southwestern willow flycatchers in California, Arizona, and southwestern Colorado (M. Sogge, pers. comm.). These samples could yield important data on prey use at various locations and timing throughout the breeding season.

The southwestern willow flycatcher begins arriving on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge et al. 1993, Sogge and Tibbitts 1994, Muiznieks et al. 1994, Maynard 1995, Sferra et al. 1995). Migration routes are not completely known. However, willow flycatchers have been documented migrating through specific locations and drainages in Arizona that do not currently support breeding populations, including the upper San Pedro River (BLM, unpubl. data), Colorado River through Grand Canyon National Park (Sogge and Tibbitts 1992, Sogge et al. 1993, Sogge and Tibbitts 1994), lower Colorado River (Muiznieks et al. 1994, Spencer et al. 1996), Verde River tributaries (Muiznieks et al. 1994), and Cienega Creek (BLM, in litt.). These observations probably include subspecies *E. t. brewsteri* and *E. t. adastus*.

Nesting begins in late May and early June and young fledge from late June through mid-August (Willard 1912, Ligon 1961, Brown 1988a,b, Whitfield 1990, Sogge and Tibbitts 1992, Sogge et al. 1993, Muiznieks et al. 1994, Whitfield 1994, Maynard 1995). Southwestern willow flycatchers typically lay three to four eggs in a clutch. The breeding cycle, from laying of the first egg to fledgling, is approximately 28 days. Eggs are laid at one-day intervals (Bent 1963, Walkinshaw 1966, McCabe 1991), are incubated by the female for approximately 12 days, and young fledge approximately 12 to 13 days after hatching (King 1955, Harrison 1979). Southwestern willow flycatchers typically raise one brood per year but have been documented raising two broods during one season (Whitfield 1990). They have also been documented

renesting after nest failure (Whitfield 1990, Sogge and Tibbitts 1992, Sogge et al. 1993, Sogge and Tibbitts 1994, Muiznieks et al. 1994, Whitfield 1994, Whitfield and Strong 1995).

Whitfield, who has accumulated the largest data set on southwestern willow flycatchers, reported the following data on survivorship of adults and young (M. Whitfield, Kern River Preserve, pers. comm.). Whitfield (1995) also documented statistically significant variation in return rates of juveniles as a function of fledgling date; approximately 21.9% of juveniles fledged on or before July 20th returned to her study area the following year, whereas only 6.4% of juveniles fledged after July 20th returned the following year.

Brood parasitism of southwestern willow flycatcher nests by the brown-headed cowbird (*Molothrus ater*) has been documented throughout the flycatcher's range (Brown 1988a,b, Whitfield 1990, Muiznieks et al. 1994, Whitfield 1994, Hull and Parker 1995, Maynard 1995, Sferra et al. 1995, Sogge 1995a). Cowbirds lay their eggs in the nests of other species directly affecting their hosts by reducing nest success. Cowbird parasitism reduces host nest success in several ways. Cowbirds may remove some of the host's eggs, reducing overall fecundity. Hosts may abandon parasitized nests and attempt to renest, which can result in reduced clutch sizes, delayed fledgling, and reduced overall nesting success and fledgling survivorship (Whitfield 1994, Whitfield and Strong 1995). Cowbird eggs, which require a shorter incubation period than those of many passerine hosts, hatch earlier giving cowbird nestlings a competitive advantage over the host's young for parental care (Bent 1963, McGeen 1972, Mayfield 1977a,b, Brittingham and Temple 1983). Where studied, high rates of cowbird parasitism have coincided with southwestern willow flycatcher population declines (Whitfield 1994, Sogge 1995b, Sogge 1995c, Whitfield and Strong 1995), or have resulted in reduced or complete elimination of nesting success (Muiznieks et al. 1994, Whitfield 1994, Maynard 1995, Sferra et al. 1995, Sogge 1995b, Sogge 1995c, Whitfield and Strong 1995). Whitfield and Strong (1995) found that flycatcher nestlings fledged after July 20th had a significantly lower return rate and that cowbird parasitism was often the cause of delayed fledgling.

Habitat Use

The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to over 7,000 feet in Arizona and southwestern Colorado. Throughout its wide geographic and elevational range, its riparian habitat can be broadly described based on plant species composition and habitat structure (Sogge et al. 1997). These attributes are among the most conspicuous components of flycatcher in conceptualizing, selecting, and evaluating suitable survey habitat. Photographs and accompanying text provided in Sogge et al. (1997) characterize the considerable variation in habitat structure and plant species composition found at breeding sites throughout the southwestern willow flycatcher's range. Two components that vary less across this subspecies' range are vegetation density and the presence of surface water.

There are other potentially important dimensions or characteristics of southwestern willow flycatcher habitat, including: size, shape, and distribution of vegetation patches; hydrology; prey

types and abundance; and interspecific competition. Underlying these are factors relating to population dynamics, such as demography (i.e. birth and death rates, age-specific fecundity), the distribution of breeding groups across the landscape, flycatcher dispersal patterns, migration routes, site fidelity, philopatry, and degree of conspecific sociality (e.g. coloniality). Most of these attributes are not well understood for the southwestern willow flycatcher. However, some of these factors may be critical to understanding current population dynamics and habitat use. For example, characterizations of suitable breeding habitat may be significantly biased if observed patterns of habitat use are influenced by intrinsic dispersal patterns and capabilities rather than overall habitat quality.

Ultimately, habitat suitability should be measured in terms of reproductive success and survivorship that result in a positive rate of population growth. The size and shape of occupied riparian habitat patches vary considerably. Southwestern willow flycatchers have been found nesting in patches as small as 0.8 hectares (e.g. Grand Canyon) and as large as several hundred hectares (e.g. Roosevelt Lake, Lake Mead). When viewed from above, the mixed vegetation types in particular often appear as a mosaic of plant species and patch shapes and sizes. In contrast, narrow, linear riparian habitats one or two trees wide do not appear to contain attributes attractive to nesting flycatchers. However, flycatchers have been found using these habitats during migration.

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of flycatcher territories and nests. Flycatchers sometimes nest in areas where nesting substrates were in standing water (Maynard 1995, Sferra et al. 1995, 1997). However, hydrological conditions at a particular site can vary remarkably in the arid Southwest within a season and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e. May and part of June). However, the total absence of water or visibly saturated soil has been documented at several sites where the river channel has been modified (e.g. creation of pilot channels), where modification of subsurface flows has occurred (e.g. agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer et al. 1996).

Southwestern willow flycatcher nests are open cup structures, approximately 8 centimeters high and 8 centimeters wide (outside dimensions), exclusive of any dangling material at the bottom. Nests are typically placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. The main branch from which the fork originates may be oriented vertically, horizontally, or at an angle, and stem diameter for the main supporting branch can be as small as three to four cm.

Nest height relative to the base of nest substrate also varies across the southwestern willow flycatcher's range and may be correlated with height of nest substrate and/or overall canopy height. Southwestern willow flycatcher nests have been found as low as 0.6 m above the ground to 14 m above the ground.

Historic egg/nest collections and species' descriptions from throughout the southwestern willow flycatcher's range confirm the bird's widespread use of willow for nesting (Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987, T. Huels in litt. 1993, San Diego Natural History Museum 1995). Of the 34 nests found by Brown in 1902 near Yuma on the lower Colorado and Gila rivers, 33 were in Goodding's willow and one was in arrowweed. Data from historic egg collections from southern California and more current studies indicate that 75 to 80% of nests were placed in willows (San Diego Natural History Museum 1995).

Currently, southwestern willow flycatchers use a wide variety of plant species for nesting substrates. At the monotypic willow stands that characterize high elevation sites in Arizona, Geyer willow was used almost exclusively for nesting (Muiznieks et al. 1994). At the inflow to Lake Mead on the Colorado River, Goodding's willow was the primary nesting substrate (R. McKernan unpubl. data). At the inflows of Tonto Creek and Salt River to Roosevelt Lake in Gila County, Arizona, both of which are comprised of monotypic stands of saltcedar, 100% of flycatcher nests were placed in saltcedar (Muiznieks et al. 1994, Sferra et al. 1995, Spencer et al. 1996). Other plant species that southwestern willow flycatcher nests have been documented in include: buttonbush, black twinberry (*Lonicera involucrata*), Fremont cottonwood, white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), Russian olive, and *S. hindsiana*.

Unitt (1987) noted that taxonomic confusion between *E. trailli* and *E. alnorum* (alder flycatcher) and among other *Empidonax* species that migrate through the southwestern U.S. probably accounted for the relative lack of research on the southwestern willow flycatcher. The alder and willow flycatchers, formerly known as Traill's flycatcher, were not officially recognized as separate species until the American Ornithologist's Union published its sixth edition Checklist of North American Birds (American Ornithological Union 1983). The lack of systematic, rangewide collections of southwestern willow flycatchers preclude a complete description of this subspecies' former distribution and abundance. However, the more than 600 egg, nest, and specimen records available from museums throughout the U.S. in combination with state, county, and local faunal accounts from the first half of the 20th Century do indicate that, historically, the southwestern willow flycatcher was more widespread and, at least, locally abundant.

Phillips (1948) first described *E.t. extimus* from a specimen collected on the lower San Pedro River near Feldman, Arizona. The taxonomic validity of *E.t. extimus* was subsequently reviewed by Hubbard (1987), Unitt (1987), and Browning (1993), and has been accepted by most authors (e.g., Aldrich 1951, Behle and Higgins 1959, Phillips et al. 1964, Oberholser 1974, Monson and Phillips 1981, Harris et al. 1987a,b, Schlorff 1990a,b, Harris 1991). Unitt (1987) reviewed historical and contemporary records of *E.t. extimus* throughout its range, determining that it had "declined precipitously..." and that although the data reveal no trend in the past few years, the population is clearly much smaller now than 50 years ago, and no change in the factors responsible for the decline seem likely.

Overall, Unitt (1987) documented the loss of more than 70 breeding locations rangewide, including locations along the periphery and within core drainages that form this subspecies' range.

Unitt estimated that, rangewide, the southwestern willow flycatcher population probably was comprised of 500 to 1000 pairs. Since 1992 more than 800 locations have been surveyed rangewide to document the status of the southwestern willow flycatcher.

Historic records for Arizona indicate the former range of the southwestern willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River. Unitt (1987) noted that "probably the steepest decline in the population levels of extimus has occurred in Arizona." The bird has been extirpated, or virtually extirpated from the Santa Cruz River (Pima Co.), upper San Pedro River (Cochise Co.), lower San Pedro River at PZ Ranch (Pinal Co.), Blue River (Greenlee Co.), Colorado River at Lees Ferry (Coconino Co.), Colorado River (Yuma Co.), Gila River (Yuma Co.), and Verde River at Tuzigoot Bridge (Yavapai Co.).

Rangewide

The historic range of southwestern willow flycatchers in California apparently included all lowland riparian areas in the southern third of the state. It was considered a common breeder where suitable habitat existed (Wheelock 1912, Willett 1912, 1933, Grinnell and Miller 1944). Authorized and unauthorized activities in riparian habitats continue to adversely affect occupied flycatcher habitat in southern California.

Unitt (1987) considered New Mexico as the state with the greatest number of extimus remaining. After reviewing the historic status of the flycatcher and its riparian habitat in New Mexico, Hubbard (1987) concluded that a decrease has occurred in the population of breeding willow flycatchers in New Mexico over historic time.

The Pecos and Rio Grande rivers in western Texas are considered the easternmost boundary for the southwestern willow flycatcher. Unitt (1987) found specimens from four locations in Brewster, Hudspeth, and Loving counties where the subspecies is no longer believed to be present. Current, systematic survey data is not available for Texas. There have been no other recent reports, anecdotal or incidental, of southwestern willow flycatcher breeding attempts in the portion of western Texas where they occurred historically. The Service believes it is likely that the southwestern willow flycatcher has been extirpated from Texas.

The taxonomic status and the historic distribution and abundance of willow flycatchers in southwestern Colorado remains unclear due to a lack of specimen data and breeding records. Specimen data reveal that southwestern willow flycatcher historically occurred in southern Utah along the Colorado River, San Juan River, Kanab Creek, Virgin River, and Santa Clara River (Unitt 1987). Their northern boundary in south-central Utah remains unclear due to a lack of specimen data from that region. The southwestern willow flycatcher no longer occurs along the Colorado River in Glen Canyon where Lake Powell inundated historically-occupied habitat, nor in unflooded portions of Glen Canyon near Lee's Ferry where southwestern willow flycatchers

were documented nesting in 1938. Similarly, recent surveys on Kanab Creek have failed to document their presence (McDonald et al. 1995). Single, territorial males and possibly a pair of southwestern willow flycatchers were documented at 2 locations on the San Juan River (San Juan Co.) in 1995, but breeding was not confirmed (Sogge 1995a).

Unitt (1987) documented 3 locations in Clark County, Nevada, from which southwestern willow flycatchers had been collected, but not found after 1970. Current survey efforts have documented a single location with 2 unmated males on the Virgin River in Clark County (Tomlinson in litt.).

Rangewide, the current known population of southwestern willow flycatchers stands at approximately 454 territories. These results indicate a critical population status; more than 75% of the locations where flycatchers have been found are comprised of 5 or fewer territorial birds and up to 20% of the locations are comprised of single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances (e.g., approximately 88 kilometer straight-line distance between breeding flycatchers at Roosevelt Lake, Gila Co., Arizona, and the next closest breeding groups known on either the San Pedro River (Pinal Co.) or Verde River (Yavapai Co.)). Additional survey effort, particularly in southern California, may discover additional small breeding groups. However, rangewide survey efforts have yielded positive results in less than 10% of surveyed locations. Moreover, survey results reveal a consistent pattern rangewide: the southwestern willow flycatcher population as a whole is comprised of extremely small, widely-separated breeding groups or unmated individuals.

The established survey method relies on singing birds as the entity defining a territory (Tibbitts et al. 1994). Because females have been documented singing as frequently as males, double-counting may be a source of sampling error that biases population estimates upward. The figure of 454 southwestern willow flycatcher territories is an approximation based on considerable survey effort, both extensive and intensive. Given sampling errors that may bias population estimates positively or negatively (e.g., incomplete survey effort, double-counting males/females, composite tabulation methodology), natural population fluctuation, and random events, it is likely that the total population of southwestern willow flycatchers is fluctuating at between 300 and 500 territories with a substantial proportion of individuals remaining unmated. If all extant sites were fully protected, at such low population levels random demographic, environmental, and genetic events could lead to extirpation of breeding groups and eventually render this species extinct. The high proportion of unmated individuals documented during recent survey efforts suggests the southwestern willow flycatcher may already be subject to a combination of these factors (e.g., uneven sex ratios, low probability of finding mates in a highly fragmented landscape).

Southwestern willow flycatcher reproductive success

Intensive nest monitoring efforts in California, Arizona, and New Mexico have revealed that: (1) sites with both relatively large and small numbers of pairs have experienced extremely high rates of brood parasitism; (2) high levels of cowbird parasitism in combination with nest loss due to predation have resulted in low reproductive success and, in some cases, population declines; (3)

at some sites, levels of cowbird parasitism remain high across years, while at others parasitism varies temporally with cowbirds absent in some years; (4) the probability of a southwestern willow flycatcher successfully fledgling its own young from a nest that has been parasitized by cowbirds is low (i.e., <5%); (5) cowbird parasitism and/or nest loss due to predation often result in reduced fecundity in subsequent nesting attempts, delayed fledgling, and reduced survivorship of late-fledged young, and; (6) nest loss due to predation appears more constant from year to year and across sites, generally in the range of 30 to 50%.

Whitfield and Strong (1995) found that, besides lowering nest success, fecundity, and the number of young produced, cowbird parasitism may also lower survivorship of southwestern willow flycatcher young fledged late in the season. Southwestern willow flycatchers that abandon parasitized nests or renest after fledgling cowbirds lay fewer eggs in subsequent clutches and, if successful, fledge young late in the season. Whitfield and Strong determined that cowbird parasitism delayed successful southwestern willow flycatcher nesting by at least 13 days and this delay resulted in significantly different return rates of juveniles. Only 6.4% of southwestern willow flycatcher young that came from late nests were recaptured in subsequent years, whereas 21.9% of young that came from early nests were recaptured. If these recapture rates mirror actual survivorship, then even though some parasitized southwestern willow flycatchers eventually fledge their own young, nest loss due to parasitism or depredation may have the more insidious effect of reducing overall juvenile survivorship. Despite the cowbird trapping program and increased reproductive success, Whitfield has not observed a population increase at her study area. Whitfield and Strong (1995) speculate that other factors in addition to cowbird parasitism, such as habitat loss and pesticide use on wintering grounds and/or stochastic events such as storms resulting in mortality, may be keeping population numbers low.

The data illustrates that cowbird parasitism and nest depredation are affecting southwestern willow flycatchers throughout their range. Cowbirds have been documented at more than 90% of sites surveyed (Sogge and Tibbitts 1992, Sogge et al. 1993, Camp Pendleton 1994, Muiznieks et al. 1994, Sogge and Tibbitts 1994, T. Ireland 1994 in litt., Whitfield 1994, C. Tomlinson 1995 in litt., Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, Maynard 1995, McDonald et al. 1995, Sferra et al. 1995, S. Cooper 1996, San Diego Natural History Museum 1995, Stransky 1995, Whitfield and Strong 1995, Griffith and Griffith 1996 in litt., Skaggs 1995, Spencer et al. 1996). Thus, the potential for cowbirds to be a persistent and widespread threat remains high. Cowbird trapping has been demonstrated to be an effective management strategy for increasing reproductive success for the southwestern willow flycatcher as well as for other endangered Passerines (e.g., least Bell's vireo [*Vireo bellii pusillus*], black-capped vireo [*V. atricapillus*], golden-cheeked warbler [*Dendroica chrysoparia*]). It may also benefit juvenile survivorship by increasing the probability that parents fledge birds early in the season. Expansion of cowbird management programs has the potential to not only increase reproductive output and juvenile survivorship at source populations, but also to potentially convert small, sink populations into breeding groups that contribute to population growth and expansion.

Nest loss due to predation is common among small Passerines. The rates documented for southwestern willow flycatchers are also typical for small Passerines (i.e., rates < 50%). However, even at these "typical" levels nest loss due to predation is a significant factor contributing to low reproductive success. Nest predation presents a difficult management challenge because of the variety of taxa involved and the difficulty in developing an effective management plan for more than one taxon. Until specific predators on southwestern willow flycatcher nests are identified, measures to reduce potential predator populations should focus on reducing human activities that attract predators, such as camping, picnicking, etc. where pets are loose and refuse is concentrated.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Canelo Hills ladies'-tresses

The species is known from only five sites in the San Pedro River watershed in Santa Cruz and Cochise counties in Arizona (Newman 1991). The total amount of occupied habitat is less than 200 acres. One site occurs on Forest Service land and the other four sites are all on private property less than 23 miles north of the Mexican border. Potential habitat exists in Sonora but surveys have not located any populations (Newman 1991).

The primary cause of species decline has been attributed to habitat loss and degradation. The Canelo Hills ladies' tresses is a wetland obligate plant species. The limited numbers of populations further increases the species vulnerability to chance extinction resulting from naturally occurring stochastic events. As human populations within Santa Cruz and Cochise counties continue to expand, demands on groundwater supplies may eventually reduce or eliminate the baseflow of the San Pedro River, which sustains the few remaining populations of this species.

Huachuca water umbel

Nine Lilaeopsis populations occur in the San Pedro River watershed in Arizona and Sonora on sites owned or managed by private landowners, Fort Huachuca Military Reservation, the Coronado National Forest, and the Bureau's Tucson Field Office. Cienega-like habitats were probably common along the San Pedro River prior to 1900 (Hendrickson and Minckley 1984, Jackson et al. 1987). These habitats are beginning to recover.

The Huachuca water umbel was located on the San Pedro River RNCA in 1994. During 1995 and 1996, 43 patches of Huachuca water umbel were located (Dave Gori, The Nature Conservancy, pers. comm.). These patches occur in five disjunct areas, including approximately two miles downstream of Fairbank, near Brunchow Hill downstream of Charleston, immediately north and south of Highway 90, approximately 2.5 miles downstream of Highway 90, and approximately one mile north of Hereford. The umbel is sensitive to flooding and populations may disappear while others become established during and after severe flood events. Two patches of Huachuca water umbel on the San Pedro River were lost during a winter flood in 1994 and had still not recolonized that area as of May of 1995, demonstrating the dynamic and often precarious nature of occurrences within a riparian system (Al Anderson, Grey Hawk Ranch, in litt. 1995). However, after high flows in 1996, no apparent loss or reduction in approximately 12 Huachuca water umbel patches were noted by Dr. Peter Warren (The Nature Conservancy, Tucson, pers. comm. 1997). The entire San Pedro RNCA is considered potential habitat for the Huachuca water umbel. It is the largest contiguous potential habitat of the umbel, and as such is considered the most important site for recovery.

Few human impacts to umbel habitat in the San Pedro River have occurred since establishment of the RNCA; however, recreation and associated impacts are becoming increasingly evident. The greatest threat to umbel habitat on the San Pedro River is continued groundwater pumping in excess of recharge in the Sierra Vista subwatershed. Recreation is occurring in some areas, and may be adversely affecting the umbel through trampling and bank erosion in some areas.

Limited numbers of populations and the small size of populations makes the Huachuca water umbel vulnerable to extinction as a result of stochastic events that are often exacerbated by habitat disturbance. For instance, the restriction of this taxon to a relatively small area in southeastern Arizona and adjacent Sonora increases the chance that a single environmental catastrophe, such as a severe tropical storm or drought, could eliminate populations or cause extinction. Populations are in most cases isolated, as well, which makes the chance of natural recolonization after extirpation less likely. Small populations are also subject to demographic and genetic stochasticity, which increases the probability of population extirpation (Shafer 1990, Wilcox and Murphy 1985).

Sonora tiger salamander

All sites for this species occur in Arizona in the Santa Cruz and San Pedro river drainages, including sites in the San Rafael Valley and adjacent portions of the Patagonia and Huachuca mountains in Santa Cruz and Cochise counties. All confirmed populations have been found in stock tanks or impounded cienegas (USFWS 1997). Most of the sites occur on land administered by the Sierra Vista Ranger District of the Coronado National Forest. Streams of both the San Pedro and Santa Cruz have impaired watersheds. Major stressors in the San Pedro watershed include turbidity, low dissolved oxygen, arsenic, copper, chromium, and zinc. The probable sources are natural, resource extraction, rangeland practices, and loss of riparian vegetation. Major stressors in the Santa Cruz include low pH, copper, turbidity, low

dissolved oxygen, lead, and arsenic. Probable sources in the Santa Cruz are resource extraction, natural, rangeland practices, and loss of riparian vegetation (ADEQ 1996c).

Southwestern willow flycatcher

Currently, 150 territories are known from 39 sites along 9 drainages statewide, including the Colorado River. As in California, the majority of breeding groups in Arizona are extremely small; of the 39 sites where flycatchers have been documented, 74% (29) contain 5 or fewer territorial flycatchers. Moreover, 15% to 18% of all sites in Arizona are comprised of single, unmated territorial birds.

Permitted activities and stochastic events also continue to adversely affect the distribution and extent of occupied and potential breeding habitat throughout Arizona. For example, the Bureau of Reclamation is operating the new conservation space at Roosevelt Lake, which at capacity would totally inundate the riparian stands occupied by Arizona's largest breeding group. As a result of Reclamation's operations on the lower Colorado River, the 445-ha Goodding's willow stand at the inflow to Lake Mead has been partially inundated since September 1995. Despite partial inundation, approximately eight pairs of flycatchers were documented nesting at the inflow during the 1996 breeding season. As of April 1997, inundation of that habitat was nearly complete. The Bureau of Reclamation projected the mortality of that stand sometime during 1997 as a result of prolonged inundation of root crowns (i.e. > two growing seasons).

In June of 1996, a catastrophic fire destroyed approximately one km of occupied habitat on the San Pedro River in Pinal County. That fire resulted in the forced dispersal or loss of up to 8 pairs of flycatchers (Paxton et al. 1996). In June, 1995, approximately three miles of occupied riparian habitat burned on the Gila River in Pinal County (Bureau of Land Management in litt.). It is not known how many flycatchers occupied that location. Approximately two km of riparian habitat burned in Graham County in the vicinity of Safford during 1996. It is not known whether that area was occupied by southwestern willow flycatchers, however, it did lie just downstream of an occupied patch that was partially eliminated by Solomon Bridge. The anticipated effect of construction of the Solomon Bridge was dispersal of flycatchers into adjacent habitat. The capability of adjacent habitat to absorb that dispersal was compromised by the fire near Safford.

EFFECTS OF THE ACTION and DISCUSSION OF CHANGES IN STANDARDS

R18-11-102. Applicability - modified rule

B.1. Waste Treatment exclusion. The water quality standards prescribed in this Article would not apply to waste treatment system including ponds, lagoons, and constructed wetlands, that are a part of such waste treatment systems. Previously, wastewater treatment applied "... only to manmade bodies of water which neither were originally created in waters of the United States (such as a disposal area in wetlands) nor resulted from the impoundment of waters of the United States." In 1980, EPA suspended and has not yet lifted the language which describes where the

wetland may occur. Under the previous standards, which did not recognize this suspension, the interpretation was that water quality standards would need to be met where the wastewater discharges into the constructed wetland. ADEQ interprets this suspended language to mean that once a wetland is constructed it is no longer considered a water of the U.S., even if the area was created by impounding a water of the U.S. Waste treatment system exclusion in the federal definition of "waters of the United States" is not conditioned by any location restrictions (ADEQ, Preamble to 1996 standards). This modified rule reflecting the suspension language removes the requirement that water quality standards be met when the water enters the wetland, only when the water leaves the wetland. This modified rule is likely to adversely affect species in both List A and List B.

Constructed wetlands can treat municipal, industrial, agricultural waste, and storm water. Municipal wastewaters include commercial and domestic wastewaters pretreated in lagoons, septic tanks, or conventional primary, secondary, and tertiary processes (screening, primary settling, trickling filters, and activated sludge). Wetlands are used for advanced treatment of industrial wastewaters including food processing wastes, textile wastes, chemical facility and refinery wastes, and other types of waste. Agricultural wastewaters include dairy wastes, feedlot wastewaters, and runoff from many agricultural practices. Wetlands may also receive additional runoff from the watershed (ADEQ 1995a). Since the nature of the constructed wetland is to remove toxic substances, long-term accumulation may contribute to problems for fish and wildlife.

Whereas visitation by wildlife to wastewater ponds vary, created wetlands may provide permanent habitat that may attract wildlife as has occurred at the Show Low wetlands. However even though Pintail Lake and Redhead Marshes are currently viewed as prime examples of wastewater treatment and wildlife habitat, before regulation, Show Low Creek received water which resulted in nutrient loading and subsequent lake eutrophication, algae blooms, and fish kills (EPA 1993a). The suspension or lack of numeric or narrative standards on these wetlands and other wetlands may have severe impacts to fish and wildlife species. If polluted, a created wetland may serve as an "attractive nuisance." Fish and wildlife may utilize the areas to drink, rest, and perhaps feed on the algae and invertebrates that may be associated with the wetlands. These waters may have the potential for elevated concentrations of salts and brine, harmful trace elements, nutrients or fertilizers, heavy metals, organic chemicals, petroleum or solvent-derived residues, pesticide residues, or other pathogenic microorganisms which can pose a risk to the health of fish and wildlife.

Constructed wetlands must be able to support a diversity of invertebrates, amphibians, fish, and birds, including threatened and endangered species. Small fish (desert pupfish, Gila topminnow, etc.) or young fish of larger species (razorback sucker, Colorado squawfish) may take advantage of seasonal connections of constructed wetlands in response to runoff. Other species like the Yuma clapper rail or Sonora tiger salamander may establish more permanent residency in these unregulated constructed wetlands. The paucity of data on the ability of created wetlands to support threatened and endangered species will limit the ability to specify losses. Constructed wetlands

that support listed fish may not be protected from the impacts of poor water quality which may result from a water body lacking standards. The lethal and sublethal impacts of contaminants in water, vegetation, and soils on plants and animals is not known and can not be quantified in the existing state of knowledge.

Avian species which prey on species associated with constructed wetlands similarly may not be protected. Other avian species attracted to the constructed wetlands may encounter nutritional losses, increased foraging time, or decreased fitness. The metals most likely to be toxic to birds include cadmium, lead, mercury, and selenium (Eisler 1985, 1987, 1988, Scheuhammer 1987, Ohlendorf et al. 1998). Juvenile ringed turtle-doves (*Streptopelia risoria*) fed up to 1,500 micrograms/gram dry weight aluminum for 63 days demonstrated no growth impairments (Scheuhammer 1987). Yet, flycatchers (*Ficedula hypoleuca*) feeding on insects that contained 1,230 micrograms/gram dry weight aluminum experienced severe eggshell defects, reduced clutch size, and a high incidence of mortality (Nyholm 1982, Nyholm and Myhrberg 1977). Migratory species like the southwestern willow flycatcher, while faced with suboptimal conditions, may have the ability to avoid prolonged exposures to elevated concentrations of contaminants through dietary diversity.

Impacts can be expected to vary by location, season, waste inflow, evaporation rates, and regional ambient background status. Higher flow rates through the wetland may flush toxic substances and increase oxygen levels. The lack of standards or established monitoring requirements on these created wetlands, will not provide information to determine if the wetlands will support a healthy array of invertebrate, plant, and animal communities. High background levels of various constituents or otherwise impaired waterbodies may exacerbate the situation. All aquatic and aquatic dependent species may be harmed by the lack of standards on constructed wetlands. Species recovery potential may not be met in constructed wetlands which provides habitat which attract fishes and wildlife, but fail to provide long term suitable habitat. The Service supports the use of constructed wetlands, as long as they are safe for aquatic and aquatic dependent resources.

B.2. Mining Impoundment Exemption.

In an April 23, 1996, letter to the EPA and ADEQ, the Service provided conditional concurrence with EPA's determination that this exemption is not likely to adversely affect listed species nor result in the destruction or adverse modification of critical habitat. This item will not be evaluated further in this consultation. The three concurrence conditions are:

1. Through EPA's oversight authority of the 404 program, EPA shall use various means to continually discourage the Army Corps of Engineers' issuance of legal conversions through an individual 404 permit in riparian areas which support or have the potential to support threatened or endangered species. In discussions with EPA, we understand that EPA has no authorities with respect to Nationwide 404 permits.
2. The BE states that the Service can consult with the Corps through the 404 program for the legal conversion of a surface water. EPA shall coordinate with the Service on input to the Corps with respect to legal conversions to ensure site-by-site protection of threatened and endangered species.

3. EPA shall host an annual meeting between EPA, the State of Arizona, Corps, and Service on riparian loss and/or mitigation with respect to legal conversions. The Service will review effects of conversions during the Triennial Review process.

R18-11-103. Rule has been repealed. Effective April 24, 1996.

R18-11-104. Designated Uses. Modified rule; EPA concluded no effect.

R18-11-105. Tributary Rule. This rule, an expanded and revised version of R18-11-104, describes the process for determining water quality standards for waterbodies that are not named in Appendix B. In addition to meeting the minimum standards to provide for the protection and propagation of fish, shellfish, and wildlife, and for recreation, in and on the water, ADEQ must also ensure the water quality standards for the downstream waters are maintained and protected.

Through this rule, the State's numerous, unnamed, unlisted perennial tributaries are afforded the protection of the downstream designated uses. A surface water that has more than one designated use must apply the most stringent criterion (R18-11-104). Applying the same or more stringent water quality standards to a waterbodies upstream, unlisted tributaries will ensure downstream standards. The Service concurs with EPA's determination that this rule is not likely to adversely affect the species in List A or List B. or result in the destruction or adverse modification of any critical habitat.

R18-11-106. Net Ecological Benefit.

The intent of this rule is to allow the Director to modify a water quality standard where it can be proven that there is a net benefit to downstream ecological resources. The primary functions of this rule is to preserve in-stream flows in effluent dependent ecosystems. As of February 1998, this rule had not been used (S. Rector, ADEQ, pers. comm.).

The effect of water diversions may vary greatly, largely dependent upon local water conditions. Where water levels were already low, removal of some portion of the water could result in a fish kill if the habitat dried up or water quality declined due to evaporation. The loss of fish, particularly a threatened or endangered species, from a portion of a river could significantly affect the species. Retaining water of lesser quality from discharge of effluent to support or create a riparian and aquatic habitat may be preferable.

The modification is subject to EPA review and approval, and therefore, site specific section 7 consultation with the Service. One of the primary considerations for this rule is that the effluent does not produce or contribute to the concentration of a pollutant in the tissues of aquatic organisms or wildlife that is likely to be harmful to humans or wildlife through food chain concentration. The bioaccumulative chemicals of concern are those chemicals which accumulates in aquatic organisms by a human health bioaccumulation factor greater than 1000. It is not clear what type of modifications will be allowed. This proposal does not specifically exclude

modification of a bioaccumulative chemical. Although, it could be difficult to justify doing so. Guidance in this area, for example the "EPA Region IX, Interim Final Guidance for Modifying Water Quality Standards and Protecting Effluent Dependent Ecosystems" should be finalized and implemented.

This rule provides a dilemma for fish and wildlife management. In the Phoenix area, for example, surface water has been diverted for urban uses and agriculture. Salt River surface flow below 93rd Avenue is primarily effluent from wastewater treatment plants and agricultural return flows. These riverine and wetland habitats are used a number of species including the Yuma clapper rail. Open water, cienegas, marshy seeps, or saturated soil typical of the area, are distinctive nesting habitats of the southwestern willow flycatcher nests. Loss of surface water and associated riparian, marsh and backwater habitats may contribute to the decline of these species. Retaining water of a lesser quality may be preferable.

Three of the conditions for the modification of the water quality standard appear to be stringent enough to ensure a healthy downstream ecosystem. In particular, the effluent must 1) create or support an ecologically valuable aquatic, wetland, or riparian ecosystem in an area where such resources are limited; 2) the discharge will not cause or contribute to a violation of a water quality standard that has been established for a downstream surface water; and 3) the discharge does not produce or contribute to the concentration of a pollutant in the tissues of aquatic organisms or wildlife that is likely to be harmful to humans or wildlife through food chain concentration. With these requirements in place, the Service believes the practice of establishing a Net Ecological Benefit is likely to adversely affect but is not likely to jeopardize listed species.

R18-11-107. Antidegradation - modified rule

In the 1994 biological opinion, the Service concluded that "...incidental take of endangered and threatened fish and bird species as a result of the **antidegradation rule without the implementation procedures** may occur but will be difficult to quantify in terms of loss of or harm to individuals because of limited data available on fish populations, because reliable estimates of fish populations are not obtainable due to sampling limitations and to the rapid population changes inherent in a short-lived species with high fecundity and structure; and due to the inadequacy of fish population sampling and prediction techniques for detecting small changes in population, including fish and invertebrate population sampling and detecting small changes in numbers of the prey base for avian species." The term and condition to implement the reasonable and prudent measure gave two requirements:

1. Pursuant to 40 CFR 131.12, adopt implementation methods for the antidegradation rule by 1995.
2. Progress and development of the implementation methods shall be made available to the Service during the public review process by mid-1994 and subsequent reviews.

ADEQ prepared draft implementation guidance in September 1994. Although the guidance has not been officially adopted by the State, it is used being used in some capacity by ADEQ staff (S. Rector, ADEQ, pers. comm.). The Executive Summary of the draft Implementation Guidelines,

states the following: "At present, an antidegradation implementation guidance which fully addresses the antidegradation standard is not available. Because of this, no characterization of the receiving water takes place, and permits are written which allow significant increases in pollutant levels. These increases in pollutant levels, while still allowing the receiving waterbody to remain in compliance with numeric water quality standards, may be degradations of existing water quality" (ADEQ 1994a). In the June 1996 biological assessment on this project, EPA noted that "... the State has not yet submitted implementation for this provision" [emphasis included in document].

The Service believes the lack of implementation guidance may adversely affect the Canelo Hills ladies'-tressess, Huachuca water umbel, Sonora tiger salamander, and the Southwestern willow flycatcher but is not expected to result in jeopardy. Currently, only about half of the streams and lakes assessed fully support the protection of aquatic and wildlife designated uses. Although this information should not be used to reflect the general water quality conditions of the state, the report states, since the samples were not collected under an unbiased probability based monitoring program (ADEQ 1996c). Yet antidegradation goals without implementation procedures are not effective. Degraded water may cause decreases in dissolved oxygen, increases in turbidity, temperature, nutrients, and toxic pollutants. The results of poor water quality is likely to adversely affect listed fish species. Poor water quality may alter useable habitat used for spawning areas, nursery grounds, or the interactions with predators and competitors. The environmental impact of these changes added to other physical and biological characteristics of Arizona rivers may alter growth, reproduction, or cause direct mortality for fish species, and a reduction in prey or decreased fitness for riparian dependent avian species.

Assessing the impact of degraded water quality is difficult in a species like the southwestern willow flycatcher which is highly migratory and may accumulate contaminants over broad geographic areas. Organochlorine residues, particularly DDE, in birds collected from the southwestern United States have historically been higher than the rest of the nation (Cain 1981, Fleming and Cain 1985). Residues of DDE collected from starlings collected in the lower Gila River far exceed the national geometric mean (King et al. 1997). Contaminants found in dead individuals in Arizona may or may not reflect local conditions, although liver tissue usually reflect recent exposure. Few studies have been conducted on the southwestern willow flycatcher. The high rate of brood parasitism by the brown-headed cowbird and habitat loss are likely the most significant threats to the species. These effects coupled with degraded water quality are likely to continue to adversely affect the species.

R18-11-108. Narrative water quality standards - modified rule

A. This rule is informally called "free from" as it lists constituents that must be absent from discharged water. Narrative standards are designed to work with the numeric standards to ensure the abundance and diversity of aquatic populations and proper functioning of riparian areas.

During the 1994 biological opinion, R18-11-108(A)(5) the "toxics rule" and R18-11-108(A)(6) the "nutrients rule" were disapproved by EPA because of the lack of implementation procedures (EPA

1993b). In a separate consultation, the Service concurred that the adoption of the Narrative Nutrient Implementation guidance and the Narrative Toxics Implementation guidance were not likely to adversely affect the species in List A nor result in the destruction or adverse modification of critical habitat. The Service reiterates the position given in the April 23, 1996, letter reflecting Part 1, Step 3 of the December 1995, draft Narrative Nutrient Implementation Guidance. "Evaluate preliminary findings and assess need for further action." The Service requests to be notified whenever threatened or endangered species are in the area to determine if site-specific section 7 consultation is needed.

Similarly, the April 1996 biological evaluation prepared by ADEQ (1996a), states that "The EPA, which is the NPDES permitting authority for Arizona, will continue to be required to consult with the Service under Section 7 of the ESA with regards to any NPDES permit that may affect a listed species." Given this opportunity to affect NPDES permits, the Service concludes that implementation guidance which is utilized on a case-by-case basis, is not likely to jeopardize listed species nor result in the destruction or adverse modification of critical habitat. The Service concludes the same with the above mentioned conditions for the species in List B.

The remaining portions of this rule were not addressed in the February 1994 biological opinion, and are therefore treated as a new rule for the purposes of this consultation. Species in List A and List B are considered below.

R18-11-108(1) ("bottom deposits rule"). Sediments serve as both a sink and a source of organic and inorganic materials. Since pesticides, polycyclic aromatic hydrocarbons (PAHs), and other chemicals tend to sorb to sediments and organic materials, concentration in sediments also occurs (Burton and MacPherson 1995). The rule states that discharge must be free from pollutants in amounts or combinations that settle to form bottom deposits that inhibit or prohibit the habitation, growth, or propagation of aquatic life or that impair recreational uses. A polluted benthic community may contribute to a low diversity or abundance of invertebrates or plants, or disturb the functions of an aquatic ecosystem.

The Service believes the lack of implementation guidance may negatively impact the species in both List A and in List B but is not likely to result in jeopardy. The lack of implementation guidance which establishes reference conditions for assessing the physical integrity of various Arizona watersheds, with adequate monitoring, and used in combination with numeric nutrient standards, will not protect listed species and their critical habitat. According to Sam Rector (ADEQ), the state is in the early stages of developing an implementation guideline for the bottom deposits narrative. This standard will address channel degradation, sediment transport and deposition and riparian function.

R18-11-108(2), R18-11-108(3), and R18-11-108(4) are human health considerations. The Service concurs with EPA's determination that this portion of the standards is not likely to adversely affect listed species or their critical habitat.

R18-11-108(7). The discharge must be free from pollutants in amounts or combinations that cause or contribute to a violation of an aquifer water quality standard. Information from Arizona's groundwater monitoring program between 1991 and 1995 included an evaluation of radiochemicals, fluoride, metals, nitrate, volatile organic compounds, and pesticides. Approximately 13 % of the 200 wells monitored exceeded the one of the standards. The point at which the water is measured is after treatment and blending of multiple sources and cannot be used to determine the quality of source water (ADEQ 1996). If discharge from a point source is contributing to ground water contamination, it would be difficult to confirm. When a constituent not naturally found in ground water indicates some source of contamination, it most likely reflects not the standard itself but a violation or exceedence of the standard. Exceedences of varying amounts and of varying amounts can not be predicted and are therefore, not covered under the provisions of this consultation, and should be evaluated separately. The Service concurs with EPAs determination that discharges in compliance with water quality standards are not likely to cause or contribute to a violation of the aquifer water quality standards, and are therefore, not likely to adversely affect listed species or result in the destruction or adverse modification of critical habitat.

R18-11-108(8). The discharge must be free from pollutants in amounts or combinations that change the color of the surface water from natural background levels of color. Similar to the "toxics rule" and the "nutrient rule," implementation procedures for this rule have not been established. Changes in color should be a much simpler effect to notice particularly if an understanding of natural variation is available. If adequate monitoring is used in combination with numeric nutrient standards, the Service concurs that this standard is not likely to adversely affected any listed species or its critical habitat.

B. This rule states that a surface water shall be free from oil, grease, and other pollutants that float as debris, foam, or scum; or that cause a film or iridescent appearance on the surface of the water; or that cause a deposit on a shoreline bank, or aquatic vegetation. This narrative rule is not associated with specific monitoring requirements. The Service has on several occasions recommended that oil and grease discharge limitations be decreased because of potential impacts to listed birds and therefore, conclude that this rule in its current format does not have the capacity to protect bird species. Oils of any kind may cause drowning of waterfowl because of loss of buoyancy, exposure because of loss of insulating capacity of feathers, and starvation and vulnerability to predators because of lack of mobility. Wetland habitats are critical for nesting, migrating, and wintering birds. Birds can be affected by petroleum through external oiling, ingestion, and habitat changes. Petroleum can be ingested through feather preening, drinking, consumption of contaminated food and inhalation of fumes from evaporating oil. Given that the Service can review site-specific discharges into areas where threatened or endangered species may occur, a separate section 7 consultation may be done and we conclude that this rule likely to adversely affect listed species but is not likely to jeopardize them.

R18-11-109. Numeric water quality standards - modified rule

Very few changes were made to this rule since the 1994 biological opinion. One change was the dissolved oxygen standard in effluent dependent waters. Previously the standard was 1.0 mg/L. The revised standard adopts a diurnal standard allowing 1.0 mg/L to continue from sunset to 3 hours after sunrise. But a standard of 3.0 mg/L from 3 hours after sunrise to sunset. Also the modified standard states that if dissolved oxygen of a surface water is less than the standard but the percent saturation of oxygen is equal to or greater than 90% then the surface water shall be deemed to be in compliance with the water quality standard for dissolved oxygen. Although this modified standard is more protective than the previously adopted standard which only required a DO of 1.0 mg/L, it may not protect all life stages of aquatic life in an effluent dependent water.

Low DO in combination with polluted water and shallow water with abundant aquatic plants may be problematic. Studies by Lloyd (1961) found that as dissolved oxygen decreased, acute toxicity of zinc, lead, copper, and phenols increased. In general, species found in warm water are less sensitive to low DO levels than salmonids and other species found in cold water. Desert pupfish, for example, can survive extremely harsh conditions that are lethal to most other fishes including dissolved oxygen concentrations to 0.1-0.4 mg/l (Barlow 1958). Gila topminnows are known to tolerate dissolved oxygen levels of 2.2 to 11 milligrams/liter (Meffe et al. 1983). Spikedace, on the other hand, requires a high level of dissolved oxygen. Excessive nutrient input and resulting algal growth may result in temporary conditions of oxygen depletion with resulting stress or death to individual spikedace. The DO numeric water quality standards may not be protective of all listed fish species, but is not likely to jeopardize their continued existence.

The species in List B, Canelo Hills ladies'-tressess, Huachuca water umbel, Sonora tiger salamander, Southwestern willow flycatcher, must be evaluated for all the numeric water quality standards. One of the numeric standards which caused the most concern in the 1992 biological opinion was the issue of bioaccumulation, or the uptake of dissolved chemicals from water (bioconcentration) and the uptake from ingested food and sediment residues from selenium and mercury. The lack of wildlife criteria for mercury and selenium were identified as the two pollutants most likely to bioaccumulate and adversely affect listed species. Information on the effects of selenium and mercury on the tiger salamander are not available, and for amphibians in general is very limited. Tanks, marshes, and other environments with stagnant water may not provide for the protection of species like the tiger salamander.

R18-11-110. Salinity of the Colorado River - No changes; EPA concluded no effect.

R18-11-111. Analytic methods - modified rule

This rule requires the analytic procedures required for samples used to determine whether a sample is in compliance with a water quality standard. The Service concurs with EPA's determination that this rule is not likely to adversely affect any listed species or their critical habitat.

R18-11-112. Unique waters - modified rule

Unique waters are the State's classification of Outstanding National Resource Waters. These unique waters are meant to ensure a higher level of water quality protection as point source discharges are prohibited. Unique waters are established for their outstanding recreational, aesthetic, and wilderness attributes, and the Service believes these designations will have a beneficial effect on listed species.

R18-11-113. Effluent dependent waters - modified rule

Revisions to R18-11-113(A), R18-11-113(B), and R18-11-113(C) were editorial and will have no effect on listed species. R18-11-113(D) is discussed below followed by R18-11-113(E).

EPA concluded no effect to several species since some of the previously listed waterbodies were deleted because they occur on tribal lands and are outside State jurisdiction. In other cases, flows have ceased because the discharge that created the effluent dependent condition has ceased. Those species include the Virgin River chub, woundfin, Gila trout, beautiful shiner, Apache trout, Yaqui catfish, Yaqui topminnow, Yaqui chub, spikedace, loach minnow, desert pupfish, bonytail chub, California brown pelican, Gila topminnow (except Santa Cruz River from Nogales to Tubac), humpback chub, Little Colorado spinedace, razorback sucker, or Sonora chub.

In the June 1996 biological evaluation, EPA stated "The following species occur in effluent dependent reaches. However, because EPA is carrying out reasonable and prudent alternatives to remove the FWS February 1994 jeopardy opinion, this provision of the water quality standards rules is unlikely to adversely effect these species or their critical habitat -bald eagle, Yuma clapper rail, and Gila topminnow (Santa Cruz from Nogales to Tubac)." This is quite accurate, the 1994 biological opinion did not conclude jeopardy to the Yuma clapper rail and bald eagle because of effluent dependent waters. The biological opinion did conclude jeopardy to the Gila topminnow on the Santa Cruz River from Nogales to Tubac because of effluent dependent waters. The reasonable and prudent alternative given for this RPA read:

Pursuant to 40 CFR 131.1&.4, adopt A&Wc criteria for cyanide, endrin aldehyde, naphthalene, pheno, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and toxaphene for the waterbody Santa Cruz River downstream from Nogales to Tubac, where these chemicals are discharged and the Gila topminnow exists

The Service does not concur with EPA's determination of is not likely to adversely affect and the jeopardy opinion issued in the 1994 biological opinion remains. Informal discussions between the Service and EPA resulted in agreement to modify this RPA to conduct side-by-side standard effluent toxicity testing and adoption of site-specific criteria based on 2 years of test results that are protective of the Gila topminnow by 1997 in the Santa Cruz River downstream from Nogales to Tubac. The draft report was made available in April 1998.

R18-11-113(E) was revised and formerly found at R18-11-205. Earlier versions of this rule stated that "This provision does not apply to point source discharges of storm water." Effluent dependent water quality standards will apply when a wastewater treatment plant discharges to an ephemeral water. The modified rule now applies effluent dependent water quality standards regardless if the discharge is point source or storm water. The stricter standards associated with

effluent dependent waters should provide better protection to associated aquatic communities, and is not likely to adversely affect listed species.

R18-11-114. Mixing Zones - modified rule

In the February 1994, biological opinion, the Service concluded that mixing zones would have no effect to most listed fish species. At that time only one mixing zone had been granted. The October 1997 revised biological evaluation by EPA concluded that mixing zones may affect, but are unlikely to adversely effect all listed species. The Service does not concur with that determination for the listed fish in List A. We do concur with EPA's determination that mixing zones are not likely to affect the bald eagle, Yuma clapper rail, or brown pelican since they may occur in areas subject to mixing.

EPA further stated that "Application of the mixing zone rule would be subject to ESA consultation on a case-by-case basis." Mixing zones increase the mass loadings of pollutant to the water body and decrease treatment requirements in the immediate area. Compliance is met by dilution not treatment. Numeric water quality standards are exceeded, but acute toxicity must be avoided, meaning no lethality should result from temporary passage through the mixing zone. The effects of the magnitude, duration, and frequency of the mixing zone must be evaluated for each listed species likely to use the area. Conditions within the mixing zone are not adequate to ensure the survival, growth, and reproduction of all organisms that might otherwise attempt to reside continuously within the mixing zone.

Mixing zones may occur to any perennial stream. The Service knows of at least one situation in Arizona where a mixing zone was issued for a NPDES permit in occupied habitat of endangered species and in critical habitat for the species: the Hoover Dam NPDES permit. A mixing zone was established for nitrogen, phosphorus, and chlorine. This discharge area is in the designated critical habitat for the razorback sucker (Xyrauchen texanus) and the bonytail chub (Gila elegans). In a separate consultation, after information provided by EPA and others, the Service, considering the dilution factor from Hoover Dam, concurred with EPA's determination that the mixing zone was not likely to adversely affect the species or its critical habitat. Although chlorine may be toxic to fish and amphibians in high amounts, the dilution associated with Hoover Dam did not result in an adverse effect to listed species. Future requests for mixing zones which occur in habitat or designated critical habitat for listed species must be evaluated separately.

Concerning the species in List B, the Service concludes that mixing zones will have no effect on the Canelo Hills ladies'-tresses or the Huachuca water umbel since these species are not likely to occur in areas where mixing would occur. It is assumed that mixing zones will not encroach or impact adjacent riparian areas or biologically sensitive areas. Properly applied, mixing zones must host a sufficient volume of water to allow proper dilution. Acute toxicity must be avoided and all organisms passing through the mixing zone are expected to survive. Mixing zones are not likely to adversely affect the Sonora tiger salamander or the Southwestern willow flycatcher and its critical habitat since neither species will occur in the aquatic environment of a mixing zone.

R18-11-115. Nutrient waivers - modified rule; EPA concluded no effect because the rule does not apply to waters that provide habitat for the listed species. The June 27, 1996, biological assessment provided by EPA, stated that "Application for individual nutrient waivers are established under NPDES permits and may require § 7 consultation on a case by case basis." Waterbodies with elevated nutrients may experience nuisance algal growth or other undesirable effects. The narrative standards are designed to work with the numeric standards to ensure the proper functioning of aquatic areas. The Service will evaluate the effects of elevated nutrients at the permit level.

R18-11-116. Resource Management Agencies - No changes; EPA concluded no effect.

R18-11-117. Canals and municipal park lakes - No changes; EPA concluded no effect.

R18-11-118. Dams and Flood Control Structures - Modified rule

Increases in turbidity that result from the routine physical or mechanical maintenance of dams and flood control structures. This rule was modified only to state that the release of water from dams is not required.

EPA concluded no effect to the following species or their critical habitat: Apache trout, desert pupfish, Gila topminnow, Gila trout, Little Colorado spinedace, loach minnow, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui chub, and the Yaqui topminnow. EPA concluded this rule, may affect but is not likely to adversely effect the following species because the increases in turbidity would be of zero or little magnitude: bonytail chub, humpback chub, razorback sucker, California brown pelican, bald eagle, and the Yuma clapper rail.

This modified rule also addresses the species in our List B. The issue of turbidity is complex and cannot fully be addressed without additional information. Whereas, Arizona streams characteristically have high sediment loads, suspended materials may reduce photosynthesis by interfering with light penetration. Suspended sediments may carry particulate bound nutrients which will increase primary productivity or be beneficial to aquatic species by providing cover from predators.

The Sonora tiger salamander has persisted in stock tanks despite periodic maintenance (USFWS 1997) and do not occur downstream of a dam or flood control structure. Similarly, the Canelo Hills ladies'-tressess, Huachuca water umbel, or southwestern willow flycatcher are not likely to occur immediately downstream of a dam or flood control structure. The Service concurs with EPA's determination that the modified rule is not likely to adversely affect these species.

R18-11-119. Natural Background - No changes

EPA concluded no effect for species in List A which we will not address further in this document. EPA concluded this rule is not likely to adversely affect species in List B. The Service does not concur with this determination for the Canelo Hills ladies'-tressess, Huachuca water umbel, southwestern willow flycatcher or the Sonora tiger salamander. The purpose of this rule is to

clarify that high amounts of pollutants may occur naturally. We acknowledge that it is difficult to address naturally occurring circumstances. Yet, natural events affect listed species as do human caused events. This natural occurrence may not be attributed to an entity causing a violation of the water quality standard, but the exceeded standard may not protect fish and wildlife resources.

The presence of high levels of toxicants must be separated from associated land uses. Arizona contains high levels of some constituents, including mercury and arsenic, the highest levels of arsenic collected from sediment and tissue samples during 1994 were associated with anthropogenic sources, primarily historic mining practices and powerplants (ADEQ 1994b). A naturally occurring substance which enters a watershed may still move through the food chain and bioaccumulate in top predators or other long lived species. High background levels of one constituent may lead to other concerns. For example, cadmium acts synergistically with zinc and cyanide and can be toxic even at very low levels.

Fish advisories were posted 1995 for Pena Blanca Lake and Arivaca Lake due to high mercury levels. In both cases, historic mining practices in an area of naturally high mercury are believed to be the primary source. The Service previously addressed the mercury issue with the EPA during the 1994 biological opinion. A tissue residue monitoring program was developed and implemented. In addition, court mandated development of total maximum daily loads for mercury for several waterbodies will be occurring over the next few years. The development of TMDLs, and an aggressive watershed management plan for problem areas may ameliorate problem areas for mercury in Arizona.

R18-11-120. Enforcement - Modified rule

The modification only deals with the exclusion of the specific practical quantitation limits. Previously a list of PQLs were provided in an appendix. That list has been removed but the use of PQLs still exist. For example, numeric water quality standard may be established at a concentration that is below the practical quantitation limit. In such cases, the water quality standard is enforceable not at the standard, but at the reliably detected or quantified practical quantitation limit. PQL detection limits may change as analytical technology improves. The stricter standard is designed to protect the designated uses, not to facilitate an enforcement action.

The Service concurs with EPA's determination that the Enforcement standard is not likely to adversely affect listed species, assuming the water quality standards are met. Any person who causes a violation of a water quality standard or any provision of this Article is subject to the enforcement provisions. Further, facilities which do not meet the 1996 water quality standards, are not protected under the analysis of this consultation and the accompanying incidental take provisions, and should have the noncompliance evaluated for potential impacts to listed species.

R18-11-121. Schedules of compliance - modified rule

The revised rule states that "A compliance schedule for an existing point source, other than a stormwater discharge, shall require compliance... no later than three years after the effective date

of a NPDES permit." A schedule to bring an existing point source into compliance is needed when immediate compliance can not be achieved. A person is not subject to penalties for violation of a water quality standard provided that such person is in compliance with the provisions of a compliance schedule.

Previously, compliance schedules were limited to ten years after the effective date (August 1986) of the 1992 water quality standards. These modified 1996 standards lift the 10 year restriction. ADEQ stated that the ten-year timeframe was to allow for Congress to resolve storm water related issues (ADEQ 1995b). However, since the Clean Water Act has not been reauthorized and the issue not addressed, ADEQ proposed to drop the 10 year window to comply with water quality standards. Since the modified rule specifically excludes stormwater permits from the three year timeframe, compliance for stormwater permits can only be issued for the duration of the permit, five years.

This rule specifically states that point sources of discharge may be established through an NPDES permit. NPDES permits with the site specific criteria must be approved by EPA and are, therefore, subject to separate consultation pursuant to section 7 of the Act. The rule also states that compliance schedules for a storm water discharge shall require implementation of all reasonable and cost effective best management practices to control the discharge of pollutants in storm water, however, there is no assurance that this will protect listed species. Unlike variances (discussed below), compliance schedules are neither pollutant specific or time limited. This rule does not address the number of compliance schedules or type or combinations of constituents which a facility may be issued, which we believe is likely to result in adverse effects to listed species and their critical habitats. Yet given the opportunity to evaluate individual requests for compliance, we believe jeopardy and the destruction or adverse modification of critical habitat can be avoided.

R18-11-122. Variances

The Director may grant a variance from a water quality standard for a point source discharge. Granting of the variance is discharger and pollutant specific, and is limited to five years. This provision prevents a watershed or waterbody variance which would be equivalent to modifying a water quality standard or removing a designated use.

The rule provides a provision for variances if installation and operation of each of the available discharge technologies to achieve compliance with the water quality standard would result in substantial and widespread economic and social impact. The Service understands the realities of communities with limited funds. It is not practical to close facilities which are unable to comply with a particular standard, particularly if they are seeking funds. Nevertheless, listed species may be negatively impacted by this rule. Yet, given the opportunity to evaluate individual requests for variances, the Service believes jeopardy and the destruction or adverse modification of critical habitat will be avoided.

Copper, selenium, and zinc while recognized as micronutrients in plants and animals but become

toxic in concentrated amounts (USEPA 1980). Ammonia which is common in wastewater effluent, is toxic to fish and is also influenced by pH and temperature. Further, copper in combination with ammonia, mercury, and zinc produce additive toxic effects on fish (Skidmore 1964, Hilmy et al. 1987, Eisler 1997). It is difficult to state which constituents should or should not be issued variances. A watershed with naturally high levels of constituents (R18-11-119) must be evaluated differently from those watersheds without high levels or with different constituent levels. For example, copper is a contaminant of concern in the lower Gila River but cadmium is not (King et al. 1997). Variance effects must be evaluated on a site specific basis.

The granting of variances might occur in waters that are designated critical habitat but do not presently contain populations of a listed species. Designation of critical habitat provides an avenue to recognize and protect areas important for the survival and recovery of a species. For example, natural populations of the razorback sucker were extirpated from historical habitats in the Gila, Salt, and Verde Rivers by the 1960's. During the late 1970's and into the 1980's, efforts were made to reestablish these populations using hatchery reared fish. These efforts have not been as successful as hoped, resulting in some believing that these areas are no longer suitable habitat. But the Service believes that some of the introduced fish have survived in these systems and these critical habitats should continue to be protected. The granting of variances should not conflict with long-term goal of maintaining the chemical, physical, and biological integrity of Arizona's surface waters.

R18-11-123. Prohibition against discharge; Sabino Creek - New rule; EPA concluded no effect.

Appendix A - Numeric water quality criteria

EPA concluded no effect on listed species and their critical habitat since EPA is pursuing reasonable and prudent alternatives and reasonable and prudent measures. As a result of the 1994 biological opinion, the Service issued the following reasonable and prudent alternatives:

1. Numeric criteria for toxic pollutants - bioaccumulative (bioaccumulative effects on fish and wildlife)

- a. Pursuant to 40 CFR 131.1 & 131.4, adopt selenium wildlife criteria that are protective of endangered and threatened species during the current triennial review rule-making process from 1994 to 1995.
- b. Pursuant to 40 CFR 131.1 & 131.4, adopt mercury wildlife criteria that are protective of endangered and threatened species during the current triennial review rule-making process from 1994 to 1995.
- c. Finalize the development of mercury and selenium 304(a) criteria for wildlife by 1998.
- d. Develop a methodology to evaluate highly lipophilic compounds in a consistent way. This methodology will be the basis for development of wildlife criteria by 1998.

2. Numeric water quality standards for toxic pollutants - adequacy of A&Ww criteria (A&Ww

criteria are less stringent)

- a. Pursuant to 40 CFR 131.1 & 131.4, adopt A&Wc criteria for cyanide and phenol for the following waterbodies where these chemicals are discharged and endangered and threatened species exists:
 - i. Little Colorado River downstream from Holbrook to its confluence with East Clear Creek
 - ii. Colorado River downstream from Parker to Yuma
 - iii. Gila River downstream from Coolidge Dam to Florence
- b. Pursuant to 40 CFR 131.1 & 131.4, adopt A&Wc criteria for cyanide, endrin aldehyde, naphthalene, phenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, toxaphene, and 1, 2, 4-trichlorobenzene, for the following waterbody where these chemicals are discharged and the Gila topminnow exists:
 - i. Santa Cruz River downstream from Nogales to Tubac

Note: In the April 8, 1994, response form EPA to the Service, EPA disagreed with the reasonable and prudent alternative stated in number 2 above.

3. Numeric criteria for toxic pollutants - criteria development (without consideration of synergistic, additive, or antagonistic effects to wildlife)

- a. Conduct side-by-side standard effluent toxicity tests using EPA standard procedures and the Service's identified target endangered and threatened species or their surrogates.
- b. Conduct toxicity tests with effluents discharged into areas only where the endangered and threatened species exist by 1997.
- c. Evaluate results conducted with standard surrogates and endangered and threatened species. If the results indicate that endangered and threatened species are more sensitive than surrogate species, then form a workgroup with EPA, the Service, and ADEQ to identify the toxicity problems and develop appropriate actions to remove the toxic effects by 1997. The development of identifying and removing the toxic effects will be consistent with adopting site-specific criteria protective of endangered and threatened species by 1997.
- d. Develop narrative biocriteria standards for the six references sites during the next triennial review from 1996 through 1999.
- e. Adopt narrative biocriteria standards by 1999.

Implementation of the above mentioned reasonable and prudent alternatives and reasonable and prudent measures varies.

Appendix B - List of Surface Waters and Designated Uses

If a navigable water has more than one designated use, the most stringent criterion must be applied. EPA concluded that this is not likely to adversely affect any listed species or its critical habitat. The Service concurs with this determination.

Appendix C - Practical Quantitation Levels

On December 13, 1995, EPA concluded that PQLs were not likely to adversely affect the five following species: bald eagle, Yuma clapper rail, California brown pelican, Gila topminnow, and razorback sucker. In April 1996, the Service concurred with EPA's determination. The use of PQLs were established for those toxic pollutants with water quality standards lower than the levels of detection. This triennial review moves to repeal the PQL standard. The Service extends that determination to conclude that the use of PQLs is not likely to adversely affect Canelo Hills ladies'-tresses, Huachuca water umbel, Sonora tiger salamander, or the southwestern willow flycatcher and its critical habitat.

SUMMARY OF EFFECTS
FOR
WATER QUALITY STANDARDS
AND
LISTED SPECIES

Water Quality Standard	List A	List B
R18-11-102 Applicability	Is not likely to jeopardize	Is not likely to jeopardize
R18-11-103	Rule has been repealed	Rule has been repealed
R18-11-104 Designated Uses	EPA concluded no effect	EPA concluded no effect
R18-11-105 Tributary Rule	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect
R18-11-106 Net Ecological Benefit	Is not likely to jeopardize and requires site specific evaluation	Is not likely to jeopardize and requires site specific evaluation
R18-11-107 Antidegradation	Is not likely to jeopardize	Is not likely to jeopardize
R18-11-108 Narrative water quality standards	see description below	see description below
R18-11-108(1) "bottom deposits"	Is not likely to jeopardize	Is not likely to jeopardize
R18-11-108(2) (3) and (4) Human health considerations	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect
R18-11-108(A) (5) "toxics rule"	Is not likely to jeopardize but requires site-specific evaluation	Is not likely to jeopardize but requires site-specific evaluation
R18-11-108(A) (6) "nutrients rule"	Is not likely to jeopardize and requires site-specific evaluation	Is not likely to jeopardize and requires site-specific evaluation
R18-11-108(7) must not cause or contribute to a violation of an aquifer water quality standard	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect
R18-11-108(8) no change in surface water color	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect
R18-11-108B oil and grease	Is not likely to jeopardize	Is not likely to jeopardize
R18-11-109 Numeric water quality standards	Is not likely to jeopardize	Is not likely to jeopardize
R18-11-110 Salinity of the Colorado River	EPA concluded no effect	EPA concluded no effect
R18-11-111 Analytic methods	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect
R18-11-112 Unique waters	Beneficial effect	Beneficial effect
R18-11-113(A) (B) and (C) Effluent dependent waters	EPA concluded no effect	EPA concluded no effect
R18-11-113(D) Classification of effluent dependent waters	EPA states agency is implementing RPA	EPA states agency is implementing RPA
R18-11-113(E) Apply effluent dependent standards where a point source or storm discharge changes an ephemeral water to an effluent dependent water.	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect

R18-11-114 Mixing Zones	Rule not likely to adversely affect bird species; is not likely to jeopardize fish species; requires site specific evaluation	Service concurs with is not likely to adversely affect
R18-11-115 Nutrient waivers	EPA concluded no effect	EPA concluded no effect
R18-11-116 Resource Management Agencies	EPA concluded no effect	EPA concluded no effect
R18-11-117 Canals and municipal park lakes	EPA concluded no effect	EPA concluded no effect
R18-11-118 Dams and Flood Control Structures	EPA concluded no effect	Service concurs with is not likely to adversely affect
R18-11-119 Natural Background	EPA concluded no effect	Is not likely to jeopardize
R18-11-120 Enforcement	Service concurs with is not likely to adversely affect but does not include facilities not in compliance	Service concurs with is not likely to adversely affect but does not include facilities not in compliance
R18-11-121 Schedules of Compliance	Is not likely to jeopardize with site specific evaluation	Is not likely to jeopardize with site specific evaluation
R18-11-122 Variances	Is not likely to jeopardize with site specific evaluation	Is not likely to jeopardize with site specific evaluation
R18-123 Prohibition against discharge; Sabino Creek	EPA concluded no effect	EPA concluded no effect
Appendix A Numeric water quality standards	EPA states agency is implementing RPA	EPA states agency is implementing RPA
Appendix B List of Surface Waters and Designated Uses	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect
Appendix C Practical Quantitation Levels	Service concurs with is not likely to adversely affect	Service concurs with is not likely to adversely affect

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of ESA.

Future anticipated non-Federal actions that may occur in or near surface waters in Arizona include grazing, off-road vehicle use, road building and maintenance, mining and mining runoff, nonpermitted use and application of pesticides, herbicides, fertilizers, and urbanization. The cumulative environmental impact of these changes has resulted in alteration of the physical and biological characteristics of many rivers in Arizona. Impacts to fishes would most likely occur as a result of the presence and continued introductions of nonnative fishes, significant changes in the hydrologic cycle, increased fragmentation and channelization of their habitat, and decreased water quality. Although degraded water quality alone is not likely to result in extinction of Arizona's fish communities, the cumulative reduction in suitable habitat resulting from many actions including water quality, habitat loss, competition with exotic fishes, and other situations could result in severe negative impacts and subsequently species extinction.

CONCLUSION

The ESA provides the means to conserve the ecosystems upon which endangered species and threatened species depend. Federal actions that affect fish and wildlife must provide for the habitat and biological needs of the species. While numerous changes to the habitat have occurred, many areas maintain or have the potential to continue to support populations of these species. Healthy aquatic systems will contribute to this support listed species.

After reviewing the current status of aquatic and aquatic dependent species in the state of Arizona, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that EPA's approval of the Arizona Water Quality standards as proposed, is not likely to jeopardize the continued existence of the any species, nor is it likely to destroy or adversely modify designated critical habitat.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but

is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. EPA has a continuing duty to regulate the activity covered by this incidental take statement. If EPA (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Due to the toxicity of individual constituents and possible additive or synergistic activity of combinations of compounds and conditions, and/or lack of implementation guidance, the Service believes that incidental take of Apache trout, beautiful shiner, bonytail chub, Colorado squawfish, desert pupfish, Gila topminnow, Gila trout, humpback chub, Little Colorado spinedace, loach minnow, razorback sucker, Sonora chub, spikedace, Virgin River chub, woundfin, Yaqui catfish, Yaqui chub, Yaqui topminnow, bald eagle, Yuma clapper rail, brown pelican, southwestern willow flycatcher, and the Sonora tiger salamander from the approval and implementation of the following rules: Applicability, Compliance schedules, Net Ecological Benefit, Narrative Water Quality standards ("bottom deposits"), Natural background, Numeric Water quality standards, and Variances rule.

Any one of these standards is not designed to operate independently. To authorize a variance the Director need only "consider" bioaccumulation, bioconcentration, and predicted exposure of biota and the likelihood that resident biota will be adversely affected. With the addition of antidegradation (R18-11-107), for example, the combination of rules are designed to determine if there is any degradation of water quality on a pollutant by pollutant basis. These must be assessed on a case-by-case basis, and are allowable only if it does not interfere with existing uses or impair the integrity of the waterbody as a whole. The Service has already concluded that "...incidental take of endangered and threatened fish and bird species as a result of the antidegradation rule without the implementation procedures may occur..." (see discussion under (R18-11-107)).

Sections 7(b)(4) and 7(o)(2) of ESA do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that ESA requires a Federal permit for removal or reduction to possession of endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law.

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of listed species will be difficult to detect for the following reasons: Incidental take of actual species numbers may be difficult to detect particularly when the species is wide-ranging and finding a dead or impaired specimen is unlikely following lethal or sublethal exposures; losses may be masked by seasonal fluctuations in numbers or other causes, (e.g., oxygen depletions for aquatic species); sublethal doses of contaminants ingested may adversely affect them by significantly impairing essential behavioral patterns including feeding, sheltering, breeding, or immune response and can not readily be separated from the lack of adherence to the standards rather than the standards themselves. As a surrogate measure of take, incidental take will be assumed to be exceeded if the reasonable and prudent measure described below is not implemented.

If, during the course of the action, the amount or extent of the incidental take anticipated is exceeded, EPA must reinitiate consultation with the Service immediately to avoid violation of section 9. Operations must be stopped in the interim period between the initiation and completion of the new consultation if it is determined that the impact of the additional taking will cause an irreversible and adverse impact on the species, as required by 50 CFR 402.14(i). An explanation of the causes of the taking should be provided to the Service.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to any listed species or destruction or adverse modification of critical habitat in Arizona.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize take:

1. Ensure that individual application of rules which are subject to EPA review and approval undergo separate section 7 consultation.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of ESA, EPA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

R18-11-102. Applicability

Constructed wetlands must ensure no bioaccumulation in the food chain. Macroinvertebrate sampling in a wetland may provide a record of food abundance and diversity and diversity for fish and wildlife. EPA must ensure water the protection of listed species and their habitat. EPA shall 1) develop shall a program to evaluate food and water consumption of listed species utilizing constructed wetlands; 2) develop a sampling protocol to ensure that prey species do not accumulate toxicants which can be consumed by higher trophic positions.

R18-11-106. Net Ecological Benefit

Develop guidance to explain the elements of this rule and how it will be implemented.

R18-11-107. Antidegradation

Similar to the species discussed in the 1994 biological opinion (those included in List A) the Service believes the lack of implementation guidance may negatively impact the Canelo Hills ladies'-tressess, Huachuca water umbel, Sonora tiger salamander, and the Southwestern willow flycatcher. EPA must ensure degradation does not result in increased loadings of pollutants, including bioaccumulative chemicals and other toxics.

- a. Pursuant to 40 CFR 131.12, adopt implementation methods for the antidegradation rule during the current triennial.
- b. Progress and development of the implementation methods shall be made available to the Service during the public review process by January 1999 and subsequent public reviews.

R18-11-108A(1). "Bottom deposits"

Develop and adopt implementation guideline for the "bottom deposits" narrative before the next Triennial review, by 1999. This standard must address channel degradation, sediment transport and deposition and riparian function.

R18-11-108B. "Free from"

Specific and frequent monitoring of oil and grease discharges must be issued to ensure sampling procedures do not bypass irregular discharges. Implement a numeric criterion in coordination with this narrative standard which assures aquatic life survival and reproduction. Facilities discharging oil and grease must continue to have individual section 7 consultation evaluations.

R18-11-119. Natural Background

Coordinate with other Federal and non-Federal entities to develop an aggressive watershed management plan for problem areas will ameliorate problem areas. Remediation of abandoned mines and related facilities in those watersheds must be addressed.

R18-11-122. Variances

Individual variances must be reviewed for impacts to listed species. During the NPDES permit process, an evaluation of the pollutant of concern must be prepared to address any listed species which may occur in the area.

Notice: To the extent that this incidental take statement concludes that take of any threatened or endangered species of migratory bird will result from the agency action for which consultation is being made, the Service will not refer the incidental take of any such migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 USC sec.s 703-712) or the Bald Eagle Protection Act of 1940, as amended (16 USC sec.s 668-668d), if such take is in compliance with the terms and conditions specified herein.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of ESA directs Federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Implement the 5 year rotating schedule to evaluate NPDES permits on a watershed basis.
2. Incorporate Geographic Information Systems to overlay the 305(b) report, 304(l) list, and 303(d) list with endangered and threatened species distribution.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the 1996 approval of the Arizona Water Quality Standards outlined. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions or if we can be of further assistance, please contact Debra Bills or Tom Gatz.

Sincerely,

A handwritten signature in black ink, appearing to read "David L. Harlow", with a long horizontal flourish extending to the right.

David L. Harlow
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ES)
Director, Arizona Department of Environmental Quality, Phoenix AZ
Director, Arizona Game and Fish Department, Phoenix, AZ

AZWQS.FNL:DB:bl

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